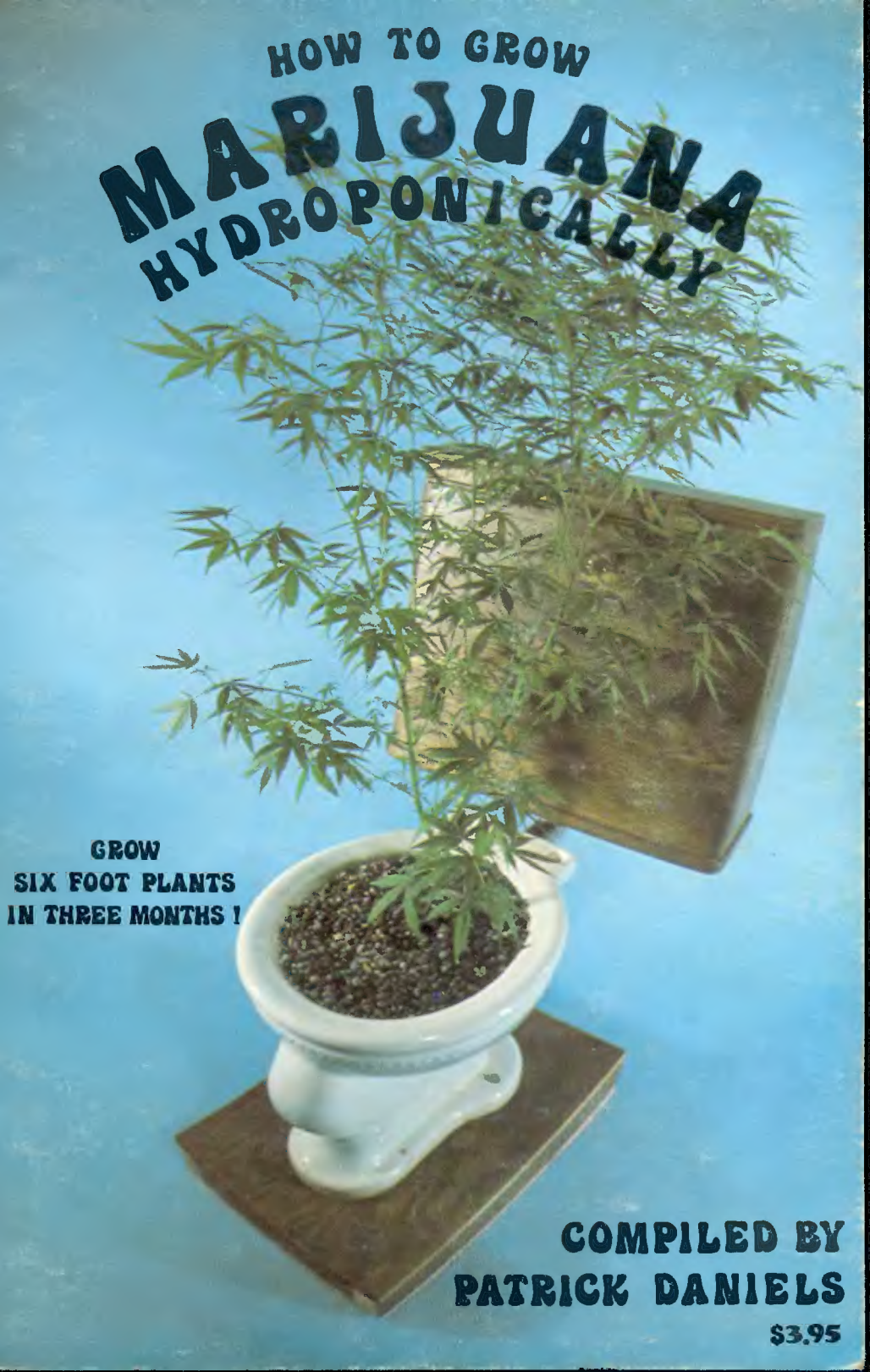
HOW TO GROW

MARIJUANA HYDROPONICALLY



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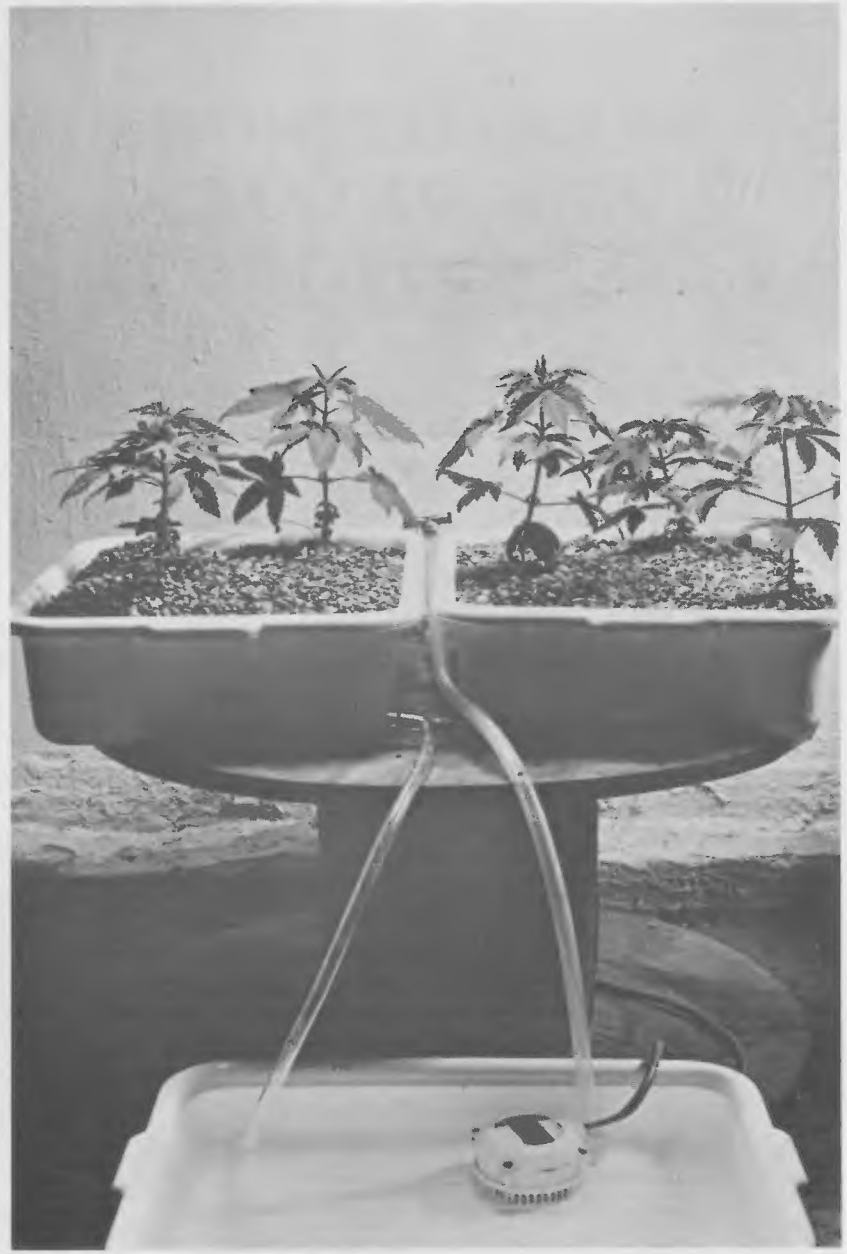

HOW TO GROW MARIJUANA HYDROPONICALLY

by

Patrick Daniels

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Chapter 1
INTRODUCTION

Well, you have opened my book, and you are probably wondering what a toilet has to do with growing marijuana . . . perhaps you have never heard of hydroponic gardening. That is what this book is all about; turning you on to an old method of growing plants in the absence of soil and using it as a brand new method of growing super weed!

The word *hydro*, meaning water, and the word *ponic*, meaning working, makes the definition of hydroponics water-working. Growing plants in an inert substance such as gravel, with a liquid nutrient solution circulating through the growing medium, results in faster growing, healthier plants.

As for the toilet, it is a completely functional hydroponic garden. There are, however, better things to use for a growing unit.

No longer is there a need to hassle with all the pots and soil one needs to grow plants the conventional way.

All you need for hydroponics is one tray four to eight inches deep that can be used for the entire growing cycle of your plants from seedlings to maturity. As for the growing medium, you can use gravel, vermiculite, sand, or even broken pottery. Best of all, it can be made fully automatic so that you don't even need a green thumb to get excellent results with hydroponics.

All the information you need to grow your favorite plants is in the chapters ahead. Of course, I do not recommend growing anything illegal! As you all know, growing marijuana is illegal in the United States. Therefore, it is the author's recommendation that you read this book for your own personal information. However, all of the information in this book can also be applied to growing legal plants, vegetables and herbs in a fraction of the time it takes with conventional methods.

Hydroponics (What is it?)

What makes a plant grow? The majority of plants require a few essentials; water, air, light, mineral salts, and a growing medium to support the roots. A plant growing in soil sends out a root system to absorb the mineral salts available in the soil. These salts, broken down into an inorganic form, are absorbed into the roots by a process known as osmosis. Carbon dioxide, from the air, is drawn into the leaves to help in the process of making new tissue. The energy needed to transform these substances into living tissue comes from light.

When the source for mineral salts dwindles, the plant sends out roots to locate a new source. The energy used up by the plant in producing new root systems amounts to lost time and energy that could be used in growing foliage.

In hydroponic gardening, a plant is grown in a medium such as gravel. To feed the plant, a nutrient solution containing mineral salts is circulated through the gravel giving the plant all the nutrition it needs for optimum growth. Since the plant has all the mineral salts readily available, the root system can be kept to a minimum, thus more energy is exerted toward foliage production.

Since the plants don't have to compete for mineral salts, they can be placed closer together. The result: higher yield and faster growing plants in the space available. Of course, there are a few things you have to know before you start the hydroponic garden. In the chapters ahead, I will cover all the details you'll need to grow super plants.

Germinating Your Seeds

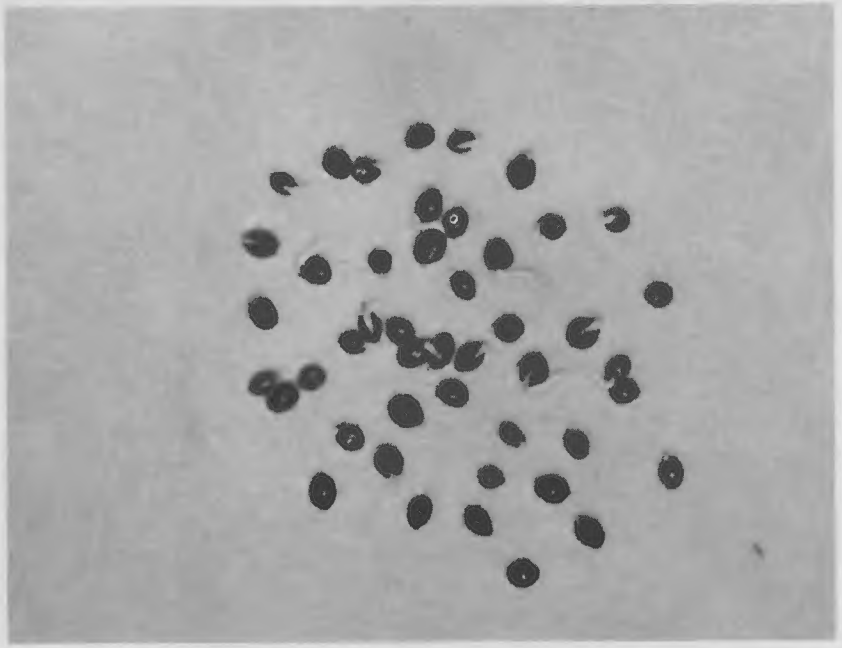
This is a good place to start. By the time your seeds germinate, you could have the hydroponic garden all set up.

In the past few years, I have seen a lot of different methods of germinating seeds. In my opinion, the paper towel method works the best. This consists of placing the seeds between four or five damp paper towels and then placing them in a warm area of the house.

Sprouts should appear in about one to seven days. It is very important to keep an eye on the sprouts to prevent them from drying out. A good practice is to water them lightly every day. As they sprout, place them into a BR 8 immediately. This is important because if you wait too long you could damage the roots.

It is best to handle the plant as little as possible. Many times roots have been damaged during transplanting; thus dwarfing the plant. Germinating the seeds first gives the grower a better selection of the healthiest sprouts. The first seeds to sprout usually grow to become the healthiest plants.

Germinating the seeds in moist paper towels is an easy method to select the hardiest growing seedlings. Once they have germinated, place the seedling into a BR 8.



Chapter 2

GROWING MEDIUM

The growing medium is a very important part of hydroponics. It would be wise to take some time in choosing the best medium available. The right decision can make or break the quality and quantity of your stash.

Requirements for a Good Growing Medium

First, it must be an inert material (a substance with no active chemicals of its own). This is important because you don't want any foreign chemicals leaching into the nutrient solution that could contaminate it. Gravel, sand, vermiculite, and perlite are some of the most commonly used inert mediums. Second, it must be a material that will not pack down too tightly. It is very important that the plant has a supply of oxygen around the root system. If the growing medium packs too tightly, the aeration will be stifled, eventually suffocating the plant. The third factor for a good growing medium is the ability to retain water. Without proper moisture around the roots at all times, the plants will die quickly.

Gravel

In my opinion, gravel is the best growing medium by far. It is readily available at stores selling cement. It is easy to clean and sterilize. The aeration is very good, and it retains water for long periods of time.

Gravel can also be re-used by simply sterilizing it after cleaning all the roots from the previous crop. The size of the gravel should be about the size of a green pea . . . hence the name "pea gravel".

I should mention that in the past, I have obtained the gravel I use from a sand and gravel company, and have never sterilized it for the first crop. After rinsing it well with fresh water it is usually safe to use. I would recommend, however, that you sterilize the growing medium after the first crop to prevent bacteria growth. This bacteria could disease future plants. If you obtain the gravel from a river bed or a source other than a sand and gravel company, it would be wise to sterilize it just to be safe.

Using Chlorine to Sterilize

You can use chlorine bleach to sterilize the growing medium by mixing a solution of ¼ cup chlorine per gallon of water. Let the gravel soak in this solution overnight, then flush thoroughly with fresh water until most of the odor is gone. If there is a remaining odor of chlorine it will not hurt the

plants, but it is important not to allow any chlorine solution to remain at the bottom of the growing tray. This would definitely harm your plants.

Sand

Sand is another popular medium used in hydroponics. It is important to use a coarse non-calcerous sand. If the sand is too fine or contains silt or soil, it will eventually pack down and prevent proper aeration. Beach and river sand can be used as long as you wash it thoroughly. If possible, it is better to buy the sand already washed and ready to go. A good place to obtain it is as a swimming pool supply store.

There is one major problem with using sand. Being more dense than gravel, it has a tendency to build up unwanted salts which will hurt the root system. It is a good idea to leach these salts out with fresh water every time you replenish the nutrient solution. This is done by running fresh water through the growing tray in place of nutrients.

Vermiculite

Vermiculite is obtained from natural mica deposits. When heated to a very high temperature, it expands to 15 times its original size. The finished product is a light-weight, sterile, highly absorbant material. Because of these properties, it is used quite often in hydroponic gardening, (usually in conjunction with another growing medium.) Since it is so highly absorbant, it isn't wise to use by itself. Mold and fungus have a tendency to grow easily in a constantly damp medium.

Vermiculite works quite well in conjunction with perlite in units that require high moisture absorption. A mixture of ½ vermiculite and ½ perlite is often used in wick systems. (See the next chapter on containers).

Perlite

Perlite is made of puffed glass that is capable of retaining over six times its own weight of water. It can be used as a growing medium by itself, or as an additive to other sterile mediums. Although it has a tendency to grow algae, it will not harm your plants. Perlite has the added advantage of not turning to "mush" as vermiculite often does. When using either one of these two mediums, it is important to use filters, as they contain fine particles that may clog up the pump. (This applies if you are using an automatic system).

Perlite and vermiculite can both be used more than once,

but it is important that it is allowed to dry out before reusing. This can be done by removing it from the growing tray and placing it in the sun until dried.

Cinders

If you use cinders for the growing medium, be sure to soak them in water for at least 24 hours to remove any excess ash. Some of the more common types of cinders used are volcanic, coal, and charcoal cinders.

Mica-Peat

It isn't wise to use mica-peat by itself as a growing medium because of its make up. It does work well as an additive to sand or vericulite to improve aeration.

Broken Bricks and Pottery

If you are really hard up for a growing medium, broken bricks or pottery can be used with good results. Break the pottery or brick into small pieces with a hammer; ⅛ to ½ inch is sufficient. Soak the pieces for 24 hours to clean away any excess clay. This is a good way to recycle any broken clay pots you may have.

Chapter 3

THE CONTAINER

There are many types of containers one can use for the hydroponic garden. Plastic dishwashing trays, plastic covered wooden boxes, old sinks, and plastic flower pots are some of the most commonly used.

The only requirements needed for a growing tray are:

1. It must be made of a material that will not decompose in water. Untreated wood, compressed fiber pots, and untreated metal containers are not good to use. Plastic containers, wood treated with fiberglass or epoxy paint, and porcelain will bring better results.

2. The growing tray must have good drainage. Without it, small pools of nutrient solution will remain on the bottom of the tray. Eventually, the root system will become rotten from being constantly wet. If this should occur, the plant will become sick and die. Be sure to put the drain at the lowest point of the growing tray, to assure complete drainage.

3. It is important that the growing tray be at least 5 inches deep for proper root growth.

If it is not this deep, the roots won't have enough area to grow, to support the plant.

Manual Feeding vs. Automatic Feeding

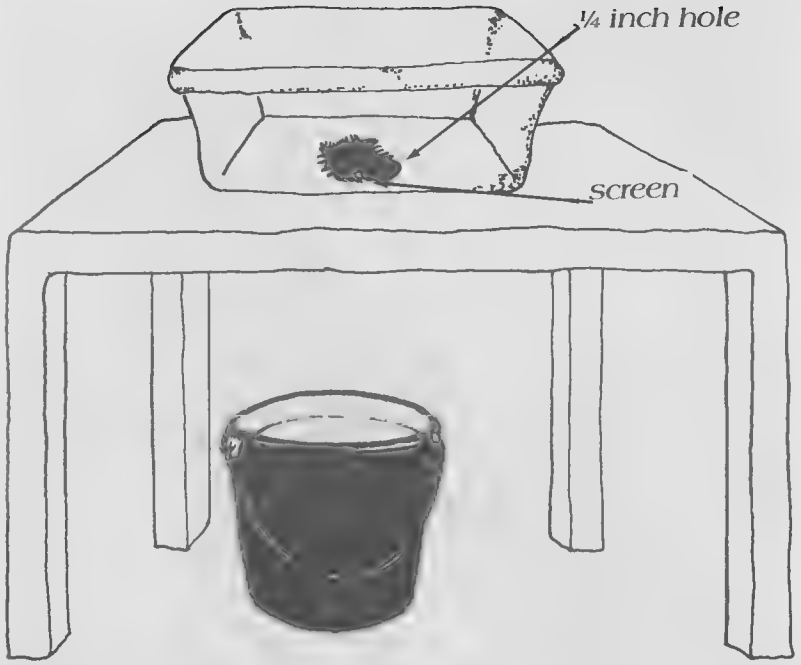
One of the big advantages of hydroponic gardening is that it can be made completely automatic. You can use a submergible pump and a timer together to do all of the scheduled feedings.

There are only two things that you will need to do. One, raise the lights occasionally, because your plants are going grow very fast once they have established themselves, (usually 2-3 weeks).

Secondly, you will need to change the nutrient solution every 10-14 days, for best results.

Manual feeding hydroponic units are excellent for the beginner. The units are easy to make, and are inexpensive as well. Although as you become more interested in hydroponics you will probably want to advance to an automatic system.

The most popular hydroponic gardens are the gravity feed type. These units are flooded one to four times daily. This is easily done with a small unit needing one to five gallons of nutrient solution. When the growing tray is larger and requires five to ten gallons of nutrient solution it is impractical to try to manually feed the plants because of the weight involved.



This hydroponic garden is simple to construct, and the results are excellent. Any plastic container that is at least five inches deep will work. Cut a ¼ inch hole in the center bottom of the container. Place a plastic screen over the hole to prevent any of the growing medium from falling through.

Use gravel, vermiculite, or perlite for the growing medium. After germinating the seeds, put them into BR 8 growing cubes. Place the cubes into the growing medium six inches apart to allow for normal growth.

Water the plants one to four times daily. To do this, simply pour the nutrient into the growing tray, then replace the bucket under the tray to allow the nutrient to flow back into the bucket.

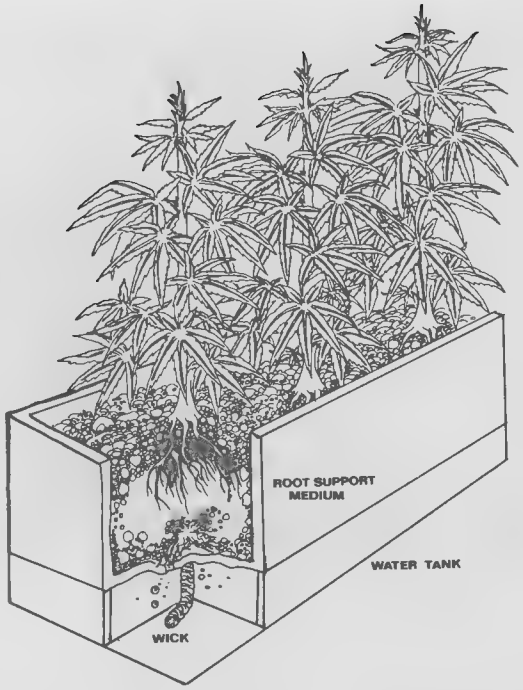
Replace the nutrient solution every ten to fourteen days. When you do replace it, pour fresh water once through the medium to leach out any build up of mineral salts.

Unless you have a bright window to put this garden near, it would be a good idea to use a plant light for best results. (Refer to the chapter on lighting to find the best light to use for your particular needs.)

This is another hydroponic garden that is used quite often, because of its ease of construction and use.

Like the previous hydroponic garden, you can use any plastic container that is at least five inches deep. The reservoir is a plastic bucket, connected to the tray by a hose.

When it is time to feed the plants, raise the bucket higher than the growing tray allowing the nutrients to drain. Then, lower the bucket so that the solution will flow back.



Probably the most trouble-free of all the hydroponic units is the wick system. The plants get the food they need through a specially treated wick suspended in the nutrient solution. This is made possible by a process known as capillary action. The wick system works very well for a small garden of four or five plants, but for a larger operation the irrigation method should be used.

To construct a wick system, you will need two containers at least six inches deep, preferably the same size. In one of the containers drill six ⅛ inch holes, in the bottom. The number of wicks the system will need depends on the size of the growing tray. Thread the wicks through the holes as in the picture, leaving approximately four inches suspended from the bottom.

The second tray should have enough nutrient in it so that when the top container is fitted into the bottom one, the wicks will be submerged in the liquid.

The next step is to fill the top container with perlite or vermiculite, (a combination of one-half perlite and one-half vermiculite works very well). In this type of unit be sure to use the previous mentioned mediums, because of their high moisture absorbing qualities. To start the capillary action of

the wicks, pour enough nutrient into the growing medium to dampen it. The system is now ready for germinated seedlings.

Unlike other types of hydroponic growing units, the wick system doesn't need the nutrient changed. It is necessary however to keep the nutrient at a constant level. Add more nutrient solution as the plants use it up.

When you decide to get into growing plants on a larger scale you may want to build a fully automatic system. The advantage to this is that it can be built to your own specification. The biggest cost of the system will be the pump and timer. The growing tray and reservoir can be built inexpensively using a wood frame lined with a vinyl plastic. The total cost for a home-made hydroponic growing system may be anywhere from $10 to $100 depending on the size, and whether it is automatic (needing a pump and timer) or manual feeding.

There are two factors that you will want to keep in mind when building a growing unit. First, if the hydroponic unit is going to be used inside under artificial lighting the growing tray should be designed to fit under your lamps. A four foot growing tray requires a four foot Gro-lux light. An eight foot growing tray requires an eight foot Gro-lux, and so on. The width of the growing tray is also governed by the amount of lamps to be used. When using a double lamp fixture, the growing tray shouldn't be wider than 12 inches, because of the amount of light the plants will receive from that single source.

The second factor is whether the growing unit is going to be automatic feeding or manual. If the unit is going to be a manual feeding system, the size will be regulated by the amount of nutrient solution needed to irrigate the growing tray.

To calculate the amount of nutrient needed to irrigate the growing medium of a given size tray, multiply the width by the length by the depth in inches. Then divide this number by 1728 (the number of inches in one cubic foot). Multiply this number by 7.5 (the approximate number of gallons in one cubic foot). This figure is the approximate number of gallons needed to fill the growing tray, but since the gravel takes up 2/3 of the area, divide the number by three. This is the number of gallons needed to irrigate the growing medium.

Once you have decided on the size and type, (automatic or manual feeding) you are ready for the construction. The sides can be made of ¾" plywood or 2" × 8" boards. The bottom should be ¾" plywood. All of the joints should be glued with a marine glue. It would also be a good idea to use corregated nails at all the joints for added strength.

At one end of the tray, drill a 1" hole for drainage. You will need a plastic hose fitting to place in the hole, (see the picture on the next page).

It is possible to coat the tray with a plastic fiberglass resin, but I have found through experience that it is a lot easier to line the tray with a vinyl plastic cloth.

For the nutrient reservoir, an exact replica of the growing tray can be made. It is also possible to use a plastic jug or container. A plastic garbage can makes a good nutrient reservoir. (A kit to build a 12" × 36" × 8" hydroponic unit is available from Indoor Garden Supply Co. in the back of the book.)

Now, the one you have been waiting for. An old toilet will work for a hydroponic garden.

To make the toilet work, you will need a pump. If you have a drill motor, a "Flotec" pump can be used in conjunction with it. This pump costs about $6.00

A water-tight box will have to be constructed to catch the nutrient solution once it has been flushed through the growing medium. You can use 2" × 4" lumber and plywood coated with asphalt emulsion, or epoxy marine paint to build the tanks.

To feed the plants, simply flush the toilet and turn the pump on. Do this four times a day for best results.

Use Plastic Pipe and Fittings

In hydroponics where you are using a liquid solution to feed the plants, it is important not to use metal pipe and fittings. Metal that isn't coated with epoxy paint or some other protective coating will eventually rust. Rust and corrosion that form on the metal will find its way into the nutrient solution, killing the plants.

Plastic is a better material to use for the hydroponic garden. It is easy to use, and is readily available at plumbing supply stores.

Chapter 4

LIGHTING

Lighting is a major part of the indoor hydroponic garden. It can determine the rate of growth, the sex, and potency of your plants. Without good light, most plants cannot complete the process known as photosynthesis. In this process, a plant makes carbohydrates (simple sugars) from carbon dioxide and water utilizing the energy from light. A waste product from this process is oxygen. When a plant is receiving only a portion of the light it needs, photosynthesis is impaired. The result can be slow growth rate, low potency, and a plant that is susceptible to insects and disease.

When growing plants outside, they may receive anywhere from 600 to 15,000 footcandles of light depending on the weather. A plant grown indoors under artificial lighting will receive anywhere from 500 to 1,800 footcandles of light depending on the type, quantity, and size of plant light used. (See chart below).

It is obvious that you would obtain better results growing plants outdoors because of the lighting difference, but unless you have a secluded spot to grow them in, I wouldn't suggest it.

Excellent results have been obtained growing plants indoors using artificial lights. There are also many advantages to growing plants indoors; the entire growing environment can be completely controlled. Insects and disease nonexistent; and the temperature and humidity are easily adjusted to the plants needs. Best of all, you can grow your favorite plant in the privacy of your own home!

Measurement in Footcandles Received by a Plant Under Artificial Lighting

Distance from lamps (inches)	*Two lamps used for 200 hours*	*Four lamps used for 200 hours*	*Four lamps New*
1	1100	1600	1800
2	860	1400	1600
3	680	1300	1400
4	570	1100	1260
5	500	940	1150
6	420	820	1000
7	360	720	900
8	330	660	830
9	300	600	780
10	280	560	720
11	260	510	660
12	240	480	600
18	130	320	420
24	100	190	260

*Footcandle is a measurement used to rate the amount of radiant energy an object may receive from a light source. One footcandle is the amount of visible light falling on one square foot located one foot away from one candle. You might want to read that again, but it doesn't really matter if you understand it. All you need to know is that the more footcandles a plant is receiving the better.

The Length of Light Per Day Determines Flower Production

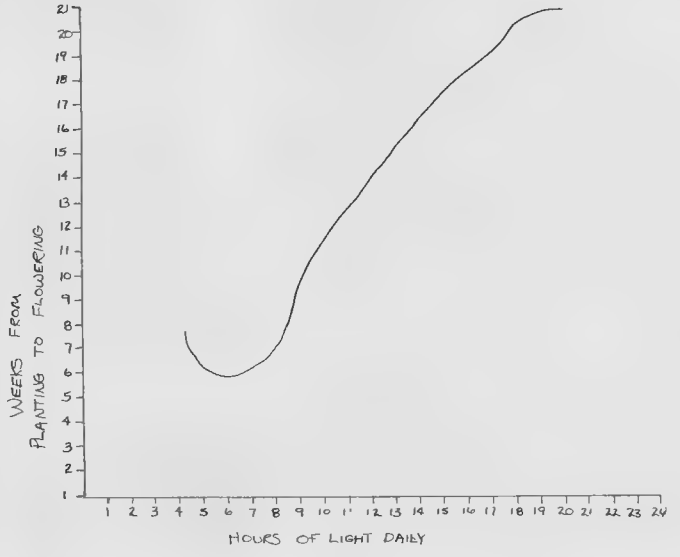
The length and amount of light a plant receives per day plays a large part in determining maturity and potency. When growing plants indoors under artificial lighting, you can control the length and intensity of the day and night period.

Marijuana plants produce resins to keep its leaves moist in times of drought. As the plant becomes older its capabilities for producing resin increases. The resin content is at its highest when the plant is producing seed.

Keeping these factors in mind, it would be best to prolong the flowering process for as long as possible, and to harvest just before pollination. A daylight period of about 18 hours light and 6 hours dark will produce a flowering plant in approximately five months. An increase of the dark period and a decrease of light will start the flowering process. To keep the day and night time constant, a timer should be used on the lights.

It is important to use sufficient lighting for the indoor hydroponic garden. It is a major factor in growing a superior crop. Use very high output fluorescent lamps, or 1000 watt metal-arc lamps for the best results. When using standard output fluorescent lighting use a minimum of two lamps, three and four are even better.

To assure good light distribution, paint the walls white or line them with aluminum foil.



Plant Lights

There are lights on the market made especially for plant growth. The most commonly used are the fluorescent types because of the color range emitted. The low heat, and the small amount of electricity used make these economical. These lamps put out, along with other colors, red and blue light. Scientists have found that plants need these colors to complete the photosynthesis process. Gro-Lux, Dura-Lite, and Vita-Light are some of the most commonly used plant lights.

Using Cool White Lamps as Plant Lights

Good results have been obtained with the use of fluorescent cool white lamps. Even though they are low in the red and far red light range, your plants will grow well under this type of lamp. They are a little cheaper than the plant lights on the market but are not specifically formulated for plant growth. Some growers swear by them; personally, I feel that the Gro-Lux plant light is superior.

Light Distance from the Plants

If you look at the table on page 31, you will notice that the amount of light the plant will receive depends on the distance from the light source. Placing a plant under a Gro-Lux lamp about one inch from the bulb will give the plant approximately 1,100 footcandles of light. Moving the lamps further from the plants will reduce this amount. It is important that you keep the fluorescent light source close to the plants at all times. Caution should be taken to keep the leaves from touching the lamps since burning may result.

How many lamps should one use for the hydroponic garden? Since light is a major element in plant growth, your plants will grow according to the amount of light they receive. Studies on light output of fluorescent lamps show that using four lamps rather than two will almost double the amount of footcandles a plant will receive. The more light the plant receives, the more vigorous its growth. Be sure to give your plants sufficient lighting; they will love you for it.

Grow-Lux Plant Lights

The Gro-Lux light made by the Sylvania Company comes in sizes 12 to 96 inches and will fit a standard fluorescent fixture. There are two types of Gro-Lux lights; the standard and wide spectrum. The difference is in the amount of light they

put out in the red and blue light spectrums. Standard Gro-Lux lamps put out 27.07% blue and 39.55% red, while the wide spectrum Gro Lux put out 14.29% blue and 21.78% red. Blue light will promote foliage and red light will promote stem growth, and flower production. A combination of standards and wide spectrum lights will work. You will have better results using all standard Gro-Lux lamps.

The standard and wide spectrum Gro-Lux lamps come in three intensities; regular output, high output, and very high output, each needing a *different* output fixture and ballast. The very high output is the best of the three but is also the most expensive.

You can see a difference in the rate of growth and potency when growing plants under a VHO lamp and fixture. It makes sense that the closer you get to simulating the light intensity of the sun, the better the results will be.

Incandescent Plant Lights

Within the last few years the large light manufacturers have come out with an incandescent light made especially for use in growing plants. Even though they are superior to the standard incandescent light we use in our homes, they can't yield the results obtained with a fluorescent lamp. The light emitted from an incandescent lamp is in the red and far red side of the light spectrum, but is very low in the blue

Energy Emission in Arbitrary Color Bands
40 Watt Flourescent Lamps
(In Watts and Percent of Total Emission)

	BAND IN NANOMETERS	WARM WHITE		COOL WHITE		STANDARD GRO-LUX		GRO-LUX/WS	
		WATTS	PERCENT	WATTS	PERCENT	WATTS	PERCENT	WATTS	PERCENT
Ultra Violet	< 380	0.13	1.52	0.16	1.68	0.10	1.42	0.27	3.16
Violet	380-430	0.46	5.15	0.72	7.57	0.70	9.67	1.07	12.48
Blue	430-490	1.15	12.91	1.98	20.78	1.96	27.07	1.22	14.29
Green	490-560	1.80	20.24	2.35	24.67	1.02	14.02	1.24	14.49
Yellow	560-590	2.06	23.17	1.74	18.27	0.10	1.42	0.83	9.77
Orange	590-630	2.13	23.95	1.69	17.75	0.44	6.05	1.36	15.93
Red	630-700	1.03	11.53	0.81	8.47	2.86	39.55	1.86	21.78
Far-Red	700-780	0.13	1.53	0.07	0.81	0.06	0.80	0.69	8.10
TOTAL		8.89	100.00	9.52	100.00	7.24	100.00	8.54	100.00

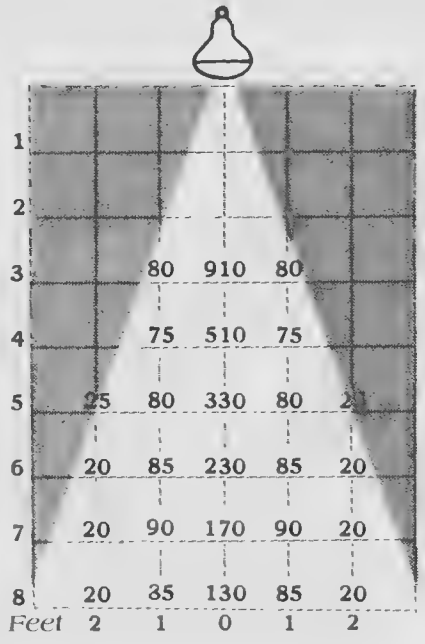
range. Since plants utilize red light in the production of flowers, the incandescent lamp makes a good supplemental lighting source to use when you want the plants to bloom.

When using an incandescent lamp, it is important to hang it at least two feet from the plants because of the heat radiated from it. Also, it would be wise to use a porcelain fixture because it can take the higher heat involved.

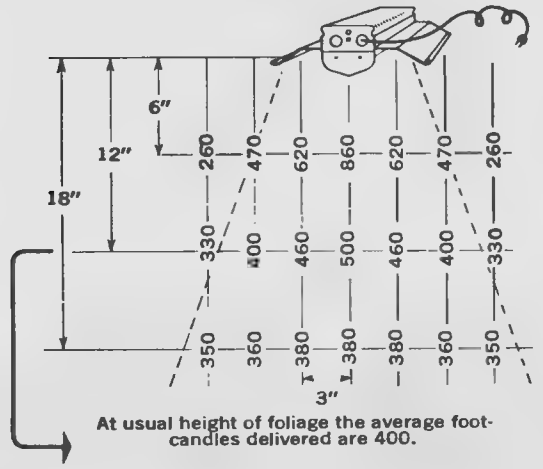
Metalarc Lamps

With the invention of the metalarc lamp, it is now possible to use these high intensity lights for plant growth. With mercury and sodium vapor lamps there was a problem with the spectrum of light they emitted. Metalarc lamps have excellent color retention, and work very well for growing plants. The average life for the metalarc when used 18 hours a day is about 9,000 hours. It should be hung in a vertical position (this is important to make it work properly), about 36" from the plants. Heat can sometimes become a problem, but with a remote ballast it can be alleviated. The two sizes used most often are the 400 watt and 1,000 watt. The best results have been obtained using the 1,000 watt lamp and fixture.

Incandescent Plant Light — Footcandles

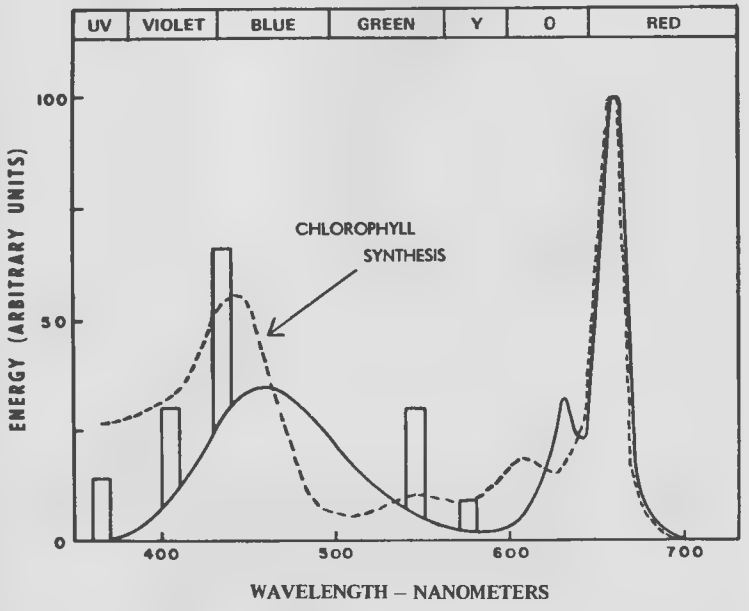


Light Output for 48 Inch Cool White Lamp



At usual height of foliage the average footcandles delivered are 400.

Light Emission of the Standard Gro-Lux



Ground the Light Fixture

Since hydroponics is growing plants in a liquid solution, it is very important to electrically ground the lighting fixtures. (Especially the metalarc type.) This can be easily done by connecting a wire from anywhere on the fixture to a cold water pipe or a metal rod stuck into the ground. Some buildings have three prong recepticles that are connected to ground. If so, obtain a plug to fit this type of recepticle and ground the fixture accordingly. If you don't know what you are doing when it comes to wiring, ask someone who does to help you. By grounding the fixture you are protecting yourself from any chance of electric shock.

To prevent any possibility of electric shock, electrically ground the lighting fixture.

Hanging Your Lights

It is best to hang the lamps from the ceiling on pulleys, because they are easily raised and lowered. I have seen plants grow up to four inches in a 24 hour period! Chances are that you will have to raise the lights everyday once the plants have established themselves hydroponically.

Life Expectancy

Fluorescent lamps last 6 to 10 times longer than the incandescent type. The life expectancy of a fluorescent plant light is approximately 12,000 hours. It is a good idea to change the lamp after about 10,000 hours, because they may lose up to 45% effective light after that. If this isn't done, the plant may suffer from the lack of light.

Lighting Efficiency

The most efficient part of a fluorescent light is the middle third. The light output gets a little weaker towards the ends of the bulb. So, save the center for your favorite plant.

Lighting Costs

The cost of running an eight foot double fluorescent fixture for 18 hours a day for one month will be approximately $2.70. This figure depends on the price of electricity in your area, and was based on a rateof 3¢ per killowatt hour.

To increase the efficiency of the growing room, paint the walls white or line them with foil. This will increase the amount of light reflected back to the plants.

Chapter 5

NUTRIENT SOLUTIONS

One advantage to hydroponic gardening is the ability to control the nutrients available to the plant. Marijuana like most plants need the three basic elements — nitrogen, phosphorus, and potassium — along with trace elements, iron, manganese, copper, zinc, boron, and molybdenum. Although no studies per se have been made on the requirements of marijuana for highest potency, it is close to the requirements for growing hops.

In the early stages of growth, marijuana needs a high amount of nitrogen and potassium and not so much calcium. In later life, the amount of calcium should be increased. During the last couple of months the nitrogen should be decreased along with the potassium and calcium to promote resin production.

Almost any commercial fertilizer can be used in hydroponics as long as it contains all of the necessary elements. Many people mix up their own nutrients to suit the plant's needs. There are, however, many good commercial plant nutrients on the market that have a guaranteed analysis.

If you wish to mix your own, Sudbury XYZ elements can be used. Excellent results have been obtained with Eco-Grow. It is far superior to most other nutrients on the market.

Also it was developed for hydroponic use.

Nitrogen

This element is quite important in the makeup of the nutrient solution. Plants use large quantities of nitrogen in the production of proteins and in chlorophyll development. During the plant's early life the demand for this element is high. As the plant matures and begins to produce seed, the need for nitrogen is less. In excess amounts, the plant will grow lush green foliage with soft sappy stems. It can also slow down the metabolism of the plant and thus slow down the flower process.

A deficiency of nitrogen may produce a slow-growing, stunted plant with a large root system. Leaves will be lighter than normal and usually small. The effects are noticed first on the older leaves.

The sources for this particular element are either calcium nitrate or sodium nitrate.

Phosporous

Phosphorous plays an important part in root and plant tissue, and is necessary for cell division. An excess of this element may occur when other elements are low such as nitrogen. When this happens, the symptoms are much like that of nitrogen deficiency. Most plants can tolerate a high level of phosphorous before showing any abnormality in growth.

A deficiency of this element will produce a stunted plant with dark-colored leaves, sometimes purplish in color. Little branching, if any, will occur. Root systems will be small, and stems will be excessively hard.

The principal source for this element is superphosphate.

Potassium

Not very much is known about what potassium does for plant growth. Some theories are that it enhances the plant's ability to resist disease and other adverse conditions. It may also function in the process of producing simple sugar from CO_2 and water. In early life of the plant, potassium produces profuse growth and foliage. In later life, high quantities of potassium will inhibit resin production.

A plant that is deficient in this element will have older leaves that are yellow with curling edges. The new growth

will start to droop, and the stems will become soft. The plant may also become susceptible to mildew and rust.

Potassium is obtained from potassium sulphate.

Calcium

Calcium is used in the makeup of plant cell walls. It acts as a sieve to other nutrients that pass through the cell wall to neutralize any excess that may occur.

During the early stages of growth, calcium in high quantities may dwarf the plant. In later life it will inhibit resin production.

In case of any deficiency, the root system will be the first to show it. They will be small, and eventually the roots may die. Plant growth will be stunted; the leaves may curl and appear dark in color.

Calcium chloride or calcium nitrate are sources of this element.

Magnesium

This is a key element in the production of chlorophyll which gives the plant its green pigment and taps the energy from the sun to make all the other processes possible. It is also thought to increase resin production in the later life of the plant. Since a seed contains pretty much all the magnesium a plant needs through middle age, any deficiency will not show up until the plant is well into its prime. If it does

occur, it is easy to spot. The leaf veins will remain green while the rest of the leaf turns yellow.

An excess of this element will produce large light-colored leaves. It will also delay flowering.

Epsom salts is a good source of magnesium.

Iron

Even though iron is a very important mineral for normal plant growth, little is known about what it actually does. When iron is deficient in plants, the leaves become pale and eventually dry up and die. Some theories are that iron is used by the plant in the production of chlorophyll.

Plants use a very little amount of iron, but it isn't always available to the plant. The problem with this mineral is that it combines with other elements in the nutrient solution forming bonds and making it impossible to break down.

The PH factor has a lot to do with the iron forming bonds. Light also plays a large part in reducing available amounts of iron. When the nutrient is towards the alkaline condition, iron will combine with the hydroxyl ion forming ferric hydroxide; thus becoming insoluble. Iron will also form bonds towards an acid PH.

Carbonates and phosphates will react with iron, so if you are into making up your own mixture, it would be wise for this reason to add the iron just before you mix in water.

When iron, along with other elements, are left in a container uncovered, light may cause them to form bonds with mineral salts in the solution. That is why many commercial nutrients come packaged in dark-colored bottles. After using the nutrients, be sure to close the cap tightly. This will assure that all the elements in the nutrient solution will be available to the plant.

Trace Elements

Zinc, boron, maganese and sulphur, in small quantities are all important in the balance of a healthy plant. Most commercial nutrient solutions have all the trace elements necessary. Since most mineral elements used for nutrient solutions are impure, it is hard to diagnose a deficiency. In excess, these elements are highly toxic and will cause death to the plant.

Water and the PH Factor

The important thing to remember about water is the PH. This one factor alone can throw the balance of the nutrient solution off, resulting in a deficiency in elements vital for healthy plants.

The PH ranges from 1.0 to 14.0 — 7.0 being neutral. The ideal PH is between 6.2 and 7.0. Below 6.2 is considered acid; above 7.0 is considered alkaline.

When the nutrient solution is either towards an alkaline or acid base, elements such as iron will combine with other elements. The combination will make them unavailable to the plant.

To prevent this from occurring, measure the PH of the water with a PH tester. If the water is towards the acid side, add a *very small* amount of sodium hydroxide, calcium carbonate or potassium hydroxide. This will raise the PH. Caution should be taken when handling hydroxides. They are caustic and shouldn't be handled with wet hands.

If you find the PH to be towards the alkaline side (which most water is), add two teaspoons of distilled white vinegar

per gallon of water to lower the PH. Two aspirins per gallon of water will also work.

When the hydroponic garden is larger than just a few gallons, you may want to use sulfuric acid to lower the PH. To do so, simply add small amounts until the PH reads lower. POUR THE ACID INTO THE WATER; DON'T POUR THE WATER INTO THE ACID. Splattering may occur. If any gets on you, wash immediately with cold water.

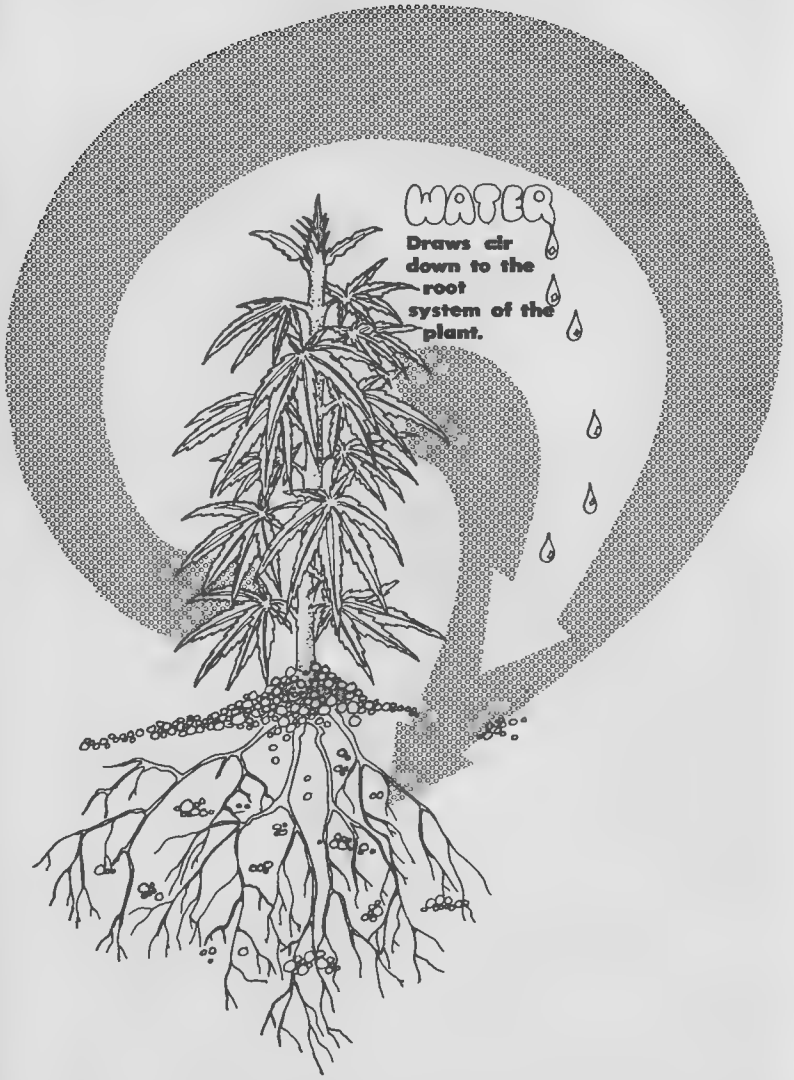
You will want to adjust the PH before any nutrients are added to the water. Check the PH again after you add the nutrients and adjust accordingly.

Water Analysis
Cedar and Tolt Rivers

Results given in milligrams per liter, i.e. parts per million, except as noted (*)

CEDAR (1)	CEDAR (2)		TOLT (3)	TOLT (4)
17.2	16.3	Alkalinity, Total (as $CaCO_3$)	5.6	2.1
17.2	16.3	Alkalinity, Bicarbonate (aa $CaCO_3$)	5.6	2.1
<0.05	<0.05	Barium (Ba)	<0.1	<0.1
<0.003	<0.003	Cadmium (Cd)	<0.003	<0.003
6.75	6.95	Calcium (Ca)	2.7	3.15
1.6	2.6	Carbon Dioxide, free (calc.)	4.0	7.3
2.9	4.7	Chloride (Cl^-)	1.9	3.6
<.005	<.005	Chromium (Cr^{+6})	<.005	<.005
10	10	*Color, std. units	14	15
<0.01	<0.01	Copper (Cu)	<0.01	0.16
0.96	0.96	Fluoride (F^-)	<0.10	0.98
21.5	21.7	Hardness, mg/l (as $CaCO_3$)	9.8	12.7
1.26	1.27	*Hardness, grains per gallon	.57	.74
0.03	0.03	Iron (Fe)	0.09	0.17
<0.02	<0.02	Lead (Pb)	<0.02	<0.02
1.1	1.05	Magnesium (Mg)	0.7	1.15
.0025	.0045	Manganese (Mn)	.008	.0055
.015	.015	Nitrate (as N)	.035	0.10
<0.01	<0.01	Nitrogen, Ammonia (as N)	<0.01	<0.01
0.05	0.04	Nitrogen, Organic (as N)	0.04	0.05
10.3	10.65	Oxygen, dissolved	10.85	10.95
93	94	*Oxygen, percent of saturation	96	101.5
7.45	7.2	*pH	6.85	6.15
40	43	Residue, Total	22	25
8.0	7.9	Silica (Reactive SiO_2)	4.9	4.4
<.003	<.003	Silver (Ag)	<.003	<.003
1.72	1.74	Sodium (Na)	0.87	0.88
52	52.5	*Specific Conductance, micromhos	17	27.5
1.9	1.3	Sulfate ($SO_4^=$)	2.3	2.3
11	10	*Temperature, °C	10	12
.45	.55	*Turbidity, FTU	.65	.8
<0.1	<0.1	Tannin-Lagnin	0.19	0.18
<0.01	<0.01	Zinc (Zn)	<0.01	0.12

A water analysis like this one can be helpful when mixing a balanced nutrient solution. It can be obtained from your local water department.



When the nutrient drains from the growing tray, air is drawn to the root system. This constant air supply around the roots is one reason hydroponics works so well.

Chapter 6

FEEDING YOUR PLANTS

The important thing to remember about feeding your plants is to keep the growing medium moist at all times. To do this, you will have to irrigate the growing tray one to five times daily. This depends on how fast the growing medium dries out in the growing trays. Most growing mediums will appear dry on the top after a short period of time. (This is a desirable trait in a growing medium, because there is less chance of algae growing on a dry surface.) Gravel will dry on the surface quickly but will remain moist below the surface for a long period of time.

When using gravel, irrigating the growing trays twice a day is usually sufficient.

How to Irrigate the Growing Trays

As I have mentioned, plants get the minerals needed for growth by flooding the growing medium with a nutrient solution. As the solution slowly drains from the tray, it pulls air into the growing medium. This is how the roots receive the oxygen needed to complete the process of osmosis. (This condition is ideal for plant growth. It is a major reason hydroponics works so well).

Irrigating the growing tray can be done in one of several ways. With a manual feeding system, simply pour the nutrient into the tray, and allow it to drain back by gravity flow.

When using the growing trays that require larger amounts of nutrient solution, it is imperative to use an electric pump to irrigate the growing tray. If you are mechanically minded at all, you can obtain a water pump from an old washing machine. There are also many excellent submergible water pumps on the market that are built for this particular purpose.

When using an electric pump, simply turn it on when it's time to feed the plants. Once the tray has been filled, allow the nutrient to drain back into the reservoir by turning the pump off. To make the unit completely automatic, use an electric timer like the Intermatic EB 11 that has a 30 minute on-off time. You can preset the feeding times and sit back and forget it.

When Should You Feed the Plants

If you are using lights to grow the plants, irrigate the growing trays at the same time the light turns on. Then irrigate again four hours before the light turns off. Never feed at night; it will throw the metabolism of your plants off.

Courtesy of Applied Hydroponics, San Rafael, California

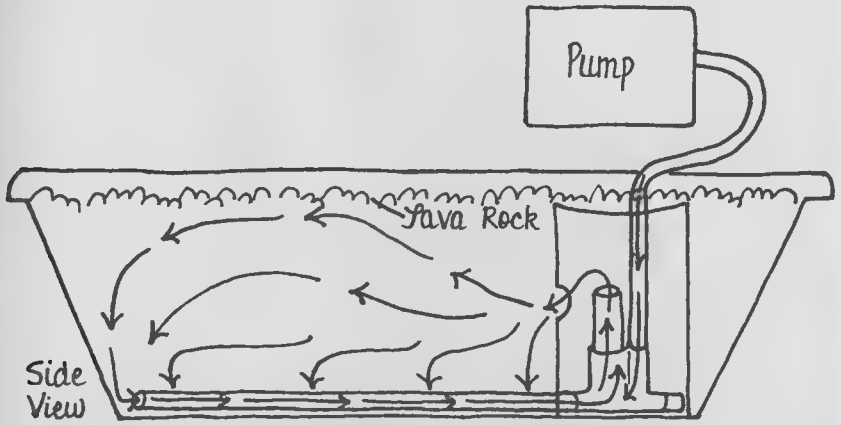
Sub Aerated Feeding

The Hydropot® has a unique method of feeding the plants. Differing from the usual wick or flush methods, the Hydropot® employs a constant aerated-circulation feeding system.

The plants are in a liquid nutrient solution that is constantly being aerated by an aquarium pump. This method eliminates the need for a separate reservoir, pump, and timer.

What makes this unit unique is the aeration device. Air bubbles are pumped into the device causing the nutrient to circulate through the lava rock medium. The plants thrive because they are getting all the air and nutrient needed for healthy growth, (see the diagram). The system works well for all kinds of plants as you can see in the picture.

The Hydropot® company has also formulated a two-part nutrient especially for their hydroponic unit. The system sells in many national magazines.



Chapter 7

SOWING AND CARE

There are a lot of products on the market for starting seeds. Kys Cubes, Jiffy 7's, and BR 8's are just a few used in hydroponic gardening. Of these three I have had the best results with the BR 8. This product is made of a cellulose fiber formulated for hydroponic gardening. It doesn't hinder the root growth like some of the other products do. Water is absorbed very quickly and is retained for a long period of time. These qualities are vital for a healthy, hydroponically grown plant.

As I said in the chapter "Germinating Your Seeds", it is very important that you place the seed into a BR 8 as soon as it sprouts. The reason for this is that when a sprout grows, it may get entangled in the paper towel. As you pull it from the towel, the tiny hairs on the root may get damaged; dwarfing the plant.

When placing the seed sprout into the BR 8, a pair of tweezers is an ideal tool to use. Always plant the root tip facing down. This isn't essential, but if it isn't done, the sprout will have to turn itself around taking more time before it actually starts growing foliage.

Once you have placed all the sprouts into BR 8's, put them into a tray (a cookie sheet or cake pan will work), and place that under a Gro-Lux lamp. Water the plants once or twice a day to keep them moist. For the first seven days water with a weak nutrient solution of ½ the mixture that is called for on the label.

It is a good idea to let the water stand for 24 hours prior to

using. This will evaporate much of the chlorine. It is important to do this in cities where chlorine is added to the water supply. In large quantities, chlorine can cause hardening of growth.

After about seven days or when the plants are about one inch tall, put them into the growing medium. Place them about six to eight inches apart. Start watering with half strength solution increasing to full strength over the next seven day period. Read the label of the nutrient you are using for the correct mixture.

Once the plants have been established in the growing beds, there are a few things to watch for. The solution should be kept at a constant level. After a period of time some of the water is lost through plant transpiration and general evaporation. This will eventually make the nutrient solution too concentrated. Just keep adding water; it will throw the balance of the nutrients off a little but won't make any difference over a period of ten to fourteen days when you should change it anyhow. Also, check the PH from time to time.

Things to Remember

As I covered in the chapter "Lighting", you will want to give your plants about eighteen hours of light and six of dark. This will result in a marijuana plant that will come to seed in about five to six months (if you don't prune it). Always water during the day cycle; watering during the night will throw the plant's metabolism off. Twice a day for watering is usually enough, but the temperature of the growing room is the determining factor. You will have to experiment to find how many times your plants will need water. The growing medium should always be kept damp but not saturated.

When your plants are in the seedling stage they are very vulnerable to pests. Both bugs and disease may attack it at this time. An organism that is most likely to attack the seedlings is known as collar-rot (or damping off). If this should occur, spray a diluted solution of Captan on the growing cube about once a week.

I should add at this point that I have had little problem with bugs and disease in the plants I have grown hydroponically. The nice thing about hydroponics is the ability to control the plant's environment. With a little bit of care, you shouldn't have any pest problems either.

Chapter 8

PROBLEMS

Even though hydroponic gardening can be trouble free, there may be some problems with the plant growth much like the ones you may encounter in soil grown plants. I will discuss some of the most common problems you may have.

My Plants are Tall and Spindly

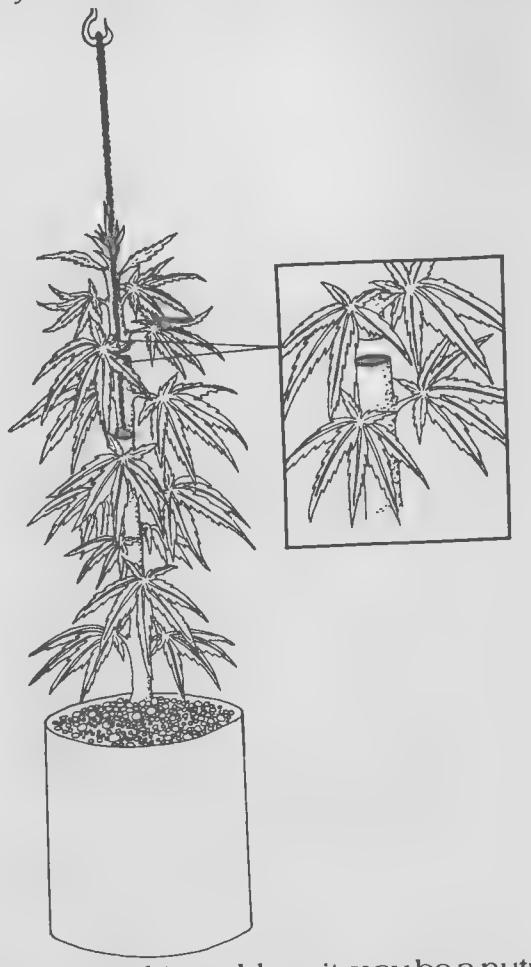
This problem is common to the indoor garden. It is a problem with the amount of light available to the plant. When the light source is too far from the plants, they will put all the energy into growing tall to reach the light they need. This is known as phototropism.

To alleviate this problem, simply bring the light source closer to your plants. When using fluorescent lighting, the lamps should be about two inches from the plant.

In some cases, the problem is that there aren't enough lamps being used. A single light is never enough to grow a plant. Two lamps is the minimum amount one should use; three and four are even better. Also, if the lamps you are using are old, the amount of light output may be impaired and insufficient for plant growth. After about 10,000 hours of use, a fluorescent light should be replaced.

The Plant is Having Problems Supporting Itself

This can be a problem in the early stages of growth. For the first week or two, foliage growth may exceed stem growth, thus making it difficult for the plant to support itself. The stems will eventually become stronger with age.



If an older plant is having this problem, it may be a nutrient imbalance or a PH problem. Check the PH and adjust accordingly. An excess of nitrogen, for instance, will make the stems soft and sappy. To remedy this, first hang a string from the ceiling above each plant. Then, using a piece of wire, loosely tie the stems to the string in an upright position. Using wood stakes in the growing medium to support the plant will also suffice.

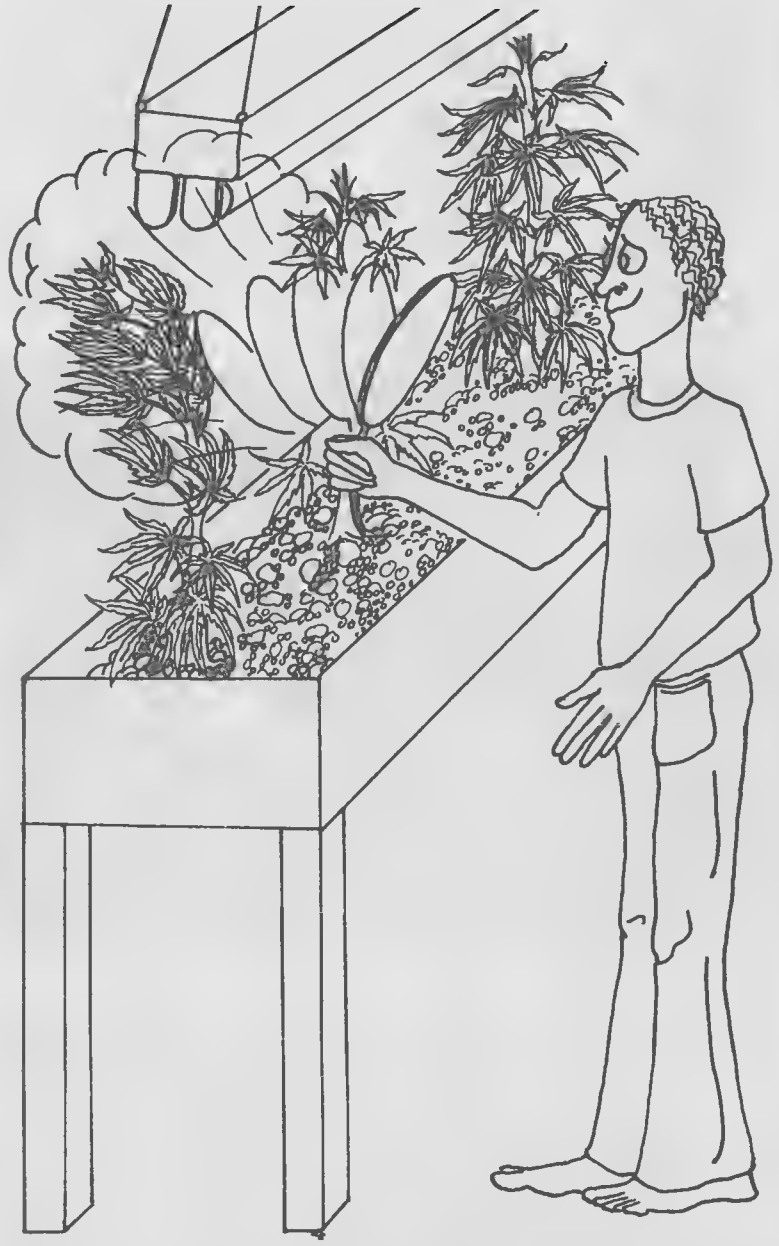
The next step will be to flush the growing tray with fresh water. This will leach out some of the toxic build-up of mineral salts. Try changing the type of nutrient you are using. Choose one with less nitrogen. Most fertilizers contain the same mineral elements but in different quantities. EcoGrow is a good bet because it contains only 10% nitrogen but in a very potent form.

An excess or deficiency of other key elements can also be the problem with weak stems but is unlikely when using commercial hydroponic nutrients. Too much standing water in the growing tray, not enough water, or insects attacking the plant can also be the problem.

Insect Control

When growing indoors, one is less likely to have problems with insects attacking the plants. But, sometimes they are brought into the growing room on your clothing or on other plants. Some of the most common insects are aphids, mealy bugs, scale, white fly, and the dreaded spider mite.

You have to be careful of what you use to rid the marijuana plant of insects. Anything poisonous to insects isn't going to do you any good. There are some organic methods one can use to rid insects but, in some cases, you will have to turn to strong insecticides. I have made a chart, on insects and what to use to get rid of them (at the end of this chapter). Refer to that chart if you are having problems with bugs.



Plants need a constant supply of fresh air for optimum growth. Placing a fan in the growing room will accomplish this. It will also help keep the humidity down.

Plant Companions as a Natural Insecticide

Some plants can be raised along with the marijuana that will act as natural insecticides such as African daises, marigolds, geraniums, and nasturtiums. These particular plants put out a scent that insects hate.

Natural Predators

Many organic gardeners use natural predators to control insects. Tree frogs, chameleon, lizards, praying mantises, ladybugs, and lacewing are the most common.

The last three listed are insects themselves but are very efficient in the control of garden pests. Ladybugs, for instance, can eat 10 times their own weight in bugs per day. Simply release these natural predators on your plants, sit back, and have a joint while they do all the clean-up work.

Home Remedies

If you don't care to use natural predators as an insect control, there are some sprays you can make that will work on aphids, spider mite and scale if you catch them in the early stages of infestation.

A sudsy solution of Fels-Naptha soap and water will wash the insects off the plants, but should be repeated once or twice a week. After applying this spray, rinse the plant with fresh water.

A concoction made from ¼ cup tobacco to four cups water will work on aphids. Allow this solution to soak over night, then strain the liquid off. Apply this mixture with a spray bottle. Repeat the application once or twice a week until the aphids are gone.

Mold and Fungus

In a large-scale hydroponic garden, the most common diseases are the fungus and molds that may grow on your plants. Working with high quantities of water, necessary in hydroponics, it is important to keep the temperature up and humidity down. If you don't, your plants may be attacked by some kind of mold or fungus. The most common fungus you may encounter are the leaf molds. You can recognize these by small patches like spores on the leaves. On the underside of the leaf you may notice velvety green or brownish spots appearing. Older leaves are affected first. Once these spores are established, any movement of the plant will send thou-

sands of them throughout the growing room infecting all of your plants.

This fungus can be controlled with a Captan solution. Use as directed on the label and only as a last resort.

It's better to stay away from chemical fungicides or insecticides if at all possible.

Preventive Measures Against Disease and Insects

Trying to prevent the cause of attack from disease and insects is sometimes easier than getting rid of the problem once it has occurred. For the most part, insects and disease will attack an unhealthy plant rather than a healthy one.

If you keep these important factors in mind you may lessen the chance of having your plants attacked. Keep the PH at a neutral level — 6.0 to 7.0 is ideal. Keep the humidity down and the temperature up. Around a 50% humidity is good. The temperature should be kept between 60 and 80 degrees. Keep the plants clean. Dust attracts spider mites and other insects. Keep the nutrient solution at a constant level, and be sure to change it every 10 to 14 days. Flush with fresh water at least every other time you change your nutrient solution.

Chemicals

All insects reproduce prolifically, and if you don't catch them before they become rampant, the plant has a good chance of kicking off. Most insects are fairly easy to get rid of with a proper home remedy or commercial insecticide spray. The spider mite is an exception. Once it has made your plant, it's home. You may have to resort to drastic measures or harvest early and smoke a few spiders.

Two insecticides that work well are Malathion and Diazanon. Used as directed on the label, these insecticides are relatively safe as far as insecticides go, because they will break down in about 7 days.

Never use Isotox or any systemic action insecticide. It penetrates the plant's tissue so that when the plant is eaten, the insect will die. Always be sure to have adequate ventilation, and avoid prolonged breathing of vapors.

To be on the safe side, allow a longer period than is called for on the label before you eat or smoke a plant you have sprayed with insecticides. A period of four weeks is safe.

PEST	DESCRIPTION	WHAT TO DO
	APHIDS These are the most common insects that you will find on house plants. They are about a sixteenth of an inch long; and may be white, green, red, black or yellow. You can find these insects on the undersides of leaves. Aphids suck out the plant's juices causing the leaves to turn pale, curl and die. You can tell their presence by a sticky substance on the leaves.	These insects are easy to get rid of with a mixture of soap and water. Simply wash them off the plant and rinse with tepid water. If they are rampant, it may be necessary to use nicotine solution. (See the chapter on problems for recipes of home remedies.) Using "Tender Leaf" will work against aphid also.
	WHITE FLIES Usually white in appearance, these are basically juice sucking insects. They will fly off the plant when it is disturbed. The eggs which they lay do most of the damage. When the eggs hatch, they feed on the sap from the plant. The leaves will turn yellow and drop off. These insects also leave a sticky substance on the leaves.	For mild cases, you can usually wash white fly eggs off the plant with a strong spray of water. In cases where your plant has them bad, a spray of "Diazinon" will work. Caution should be taken when using a chemical. Used as directed, they can be relatively safe, but you should wait for a period of three weeks before any plant is eaten or smoked.
	SCALE The scale is an insect that covers itself with a brownish colored shell. You will usually find them located along the veins on the underside of the leaves. A sticky substance will appear on the leaves, and the plant will become pale and die.	To get rid of these pests, the best thing to do is wipe them off with a cotton swab dipped in rubbing alcohol. Then rinse with warm water. Tedious . . . yes, but it works better than any other methods.

PEST	DESCRIPTION	WHAT TO DO
	SPIDER MITES Once these insects attack the plant it is hard to get rid of them. They are microscopic in size and leave a light web on the plant. You can tell their presence by minute white spots on the leaves. In time, the plant will become stunted and die.	When the dreaded spider mite attacks your plants, it is usually doomed. First, move them away from the rest of the plants. Try washing them off with a mild soap and water solution, then rinse with tepid water. You can try using Diazinon or Malathion insecticide. Use as directed on the label. Wait for a period of three weeks before eating or smoking a plant that has been sprayed. If the spider mites persist, time to harvest and smoke a few bugs.
	MEALY BUGS These insects appear similar to the scale. They cover themselves with a wax coating that looks like small cotton clusters. You will find these insects under the leaves and sometimes along crevices on top. They are about ⅛ inch in size and lay a large amount of eggs. Because these insects suck the plant's juices, it is only a matter of time before the plant will die.	Do the same thing you would do to get rid of scale. Wash off with rubbing alcohol on a cotton swab. Then rinse with warm water.

Chapter 9

HARVESTING YOUR PLANTS

Almost every marijuana plant grower has their own method of harvesting. Everything from boiling the roots to building a special drying box. And, of course, I also have a method but can't really claim it as my own, because it is used by many growers.

Two Weeks in Advance

When your plant has reached the time in which it is ready for harvesting, you will want to change the feeding. Two weeks prior to harvesting use only water, without nutrients added. This will purify your plants, and help alleviate nutrient build-up.

Reduce the Amount of Feeding

For the last two weeks prior to harvesting, you will want to reduce the watering to once a day. For the last four to five days, stop watering altogether until the leaves begin to droop.

The reason for doing this is to slowly dehydrate the plant. When marijuana becomes dehydrated, it sends resins into the leaves to try to prevent them from drying out. This is exactly what you want to happen because the higher the resin content, the better the quality.

Once the plant is drooping, pull the plant from the growing medium — roots and all — and hang it upside down to allow more resins from the roots to flow into the leaves and stems.

You can leave the plant in this position until it is competely dry. Pull off all the leaves and place them into a jar with a tight lid. Check the jar everyday to be sure there isn't any mold growing. A bad smell will tell you if mold is present.

If you detect mold, simply spread the leaves out on a newspaper and allow them to dry a little more. Rinse and dry the jar, and return the leaves to it for as long as possible. The results from this method will be a mild smoking joint. The leaves will be dry, but will feel moist to the touch like fine tobacco.

Dry Ice

The use of dry ice in curing marijuana seems to increase the potency. The reason for this is that there is a chemical reaction between the dry ice (frozen CO_2) and the cannabidiol in the marijuana, producing more THC (one of the constituents of marijuana that gets you high).

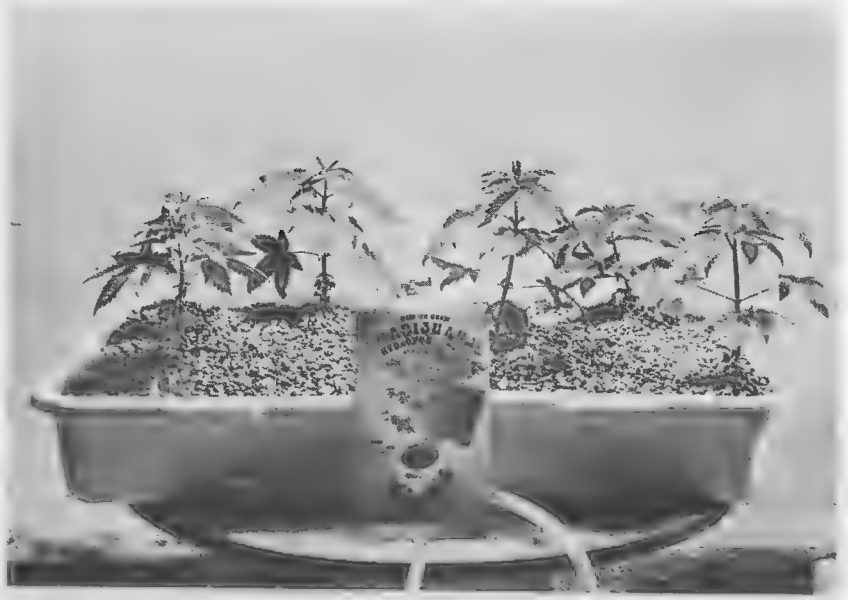
To cure your plants this way, place the already dried leaves on a 10 to 15 pound chunk of dry ice. Wrap them both together in newspaper (the better insulated, the longer the ice will last). Then, place this package in a cooler until the ice is gone. A period of 48 hours is the minimum time to leave them together; the longer the better. The CO_2 is not harmful to you.

Chapter 10
A QUICK REVIEW

1. Germinate your seeds in four or five moist paper towels. Sprouts will appear in about three to seven days.
2. Plant the seed sprouts immediately into a BR 8 growing cube. Place under Gro-Lux lights. Position the lights one inch from the BR 8. Give the plants an 18 hour day period and a 6 hour night.
3. Water twice a day with tepid water and a weak nutrient solution for the first seven days or until the plants are one inch tall. Then, gradually increase to full strength. Keep the PH between 6.2 and 7.0.
4. Get your growing tank and reservoir put together. Make the growing tank at least five inches deep. Also, get plant light set up. A plastic garbage can makes a good nutrient reservoir.

5. Choose the growing medium and hydroponic plant nutrient to be used. Gravel being the superior for marijuana. Rinse the growing medium with fresh water, and sterilize if it was obtained from a river bed or some other source where it might have picked up bacteria. Gravel obtained from a store can be used for the first crop without sterilizing but should still be rinsed.

6. Once plants have reached two inches, you can place them into the growing medium. Space the plants about 6 to 8 inches apart. Gradually work up to full strength nutrient solution over a period of seven days. Keep the growing medium moist; watering twice a day should be sufficient. If needed, water more often.
7. Periodically check the PH factor of the nutrient solution. Keep it between 6.2 and 7.0. If your reservoir is only a few gallons, add two aspirin to lower the PH a couple of points. White vinegar can also be used to lower the PH. To raise the PH, add a very small amount of calcium oxide (Quicklime) or sodium hydroxide (see chapter on PH factor).
8. Change the nutrient solution every ten to fourteen days. Rinse with fresh water at least every other nutrient change to prevent a toxic salt build-up.
9. Sit back and watch your plants grow; it's literally, almost possible.



When a book is finally completed, an author can seldom say it was done without any outside help. It takes many peoples' talents to produce a book from an idea to a bound copy. I would like to thank those who shared their talents with me.

Debbie, for the encouragement she gave me to finish the book, and for all those late nights spent editing. You started my interest in hydroponics. Steve, for sharing his knowledge of how a book should be compiled. Evelyn, for her great illustrations and editing ability. Roger from EcoGrow, for his vast knowledge of hydroponics. Thank you for editing. Eddie, Gary and Larry, for use of their plants for pictures. Sid, for the time he put in helping with pictures.

Typesetting by Carla at Pacific Press of Seattle, Inc.

Thank you again.

A Final Word

I hope you use the information in this book to your advantage. In researching hydroponics over the years, I found that it is used in many parts of the world for growing large quantities of food. Eventually, with our growing population, we we may need hydroponics as a source for our food.

Learning how to grow things hydroponically may be a greater value to you in the years to come.

If you have any questions that you felt were not explained in the book, please drop me a line. Perhaps you may discover something of value to me and the rest of my readers. I would be happy to gain your information and pass it along.

Live well and grow well.

Sincerely,
Patrick Daniels

Indoor Garden Supply Company Catalog

GRO-LUX LAMPS

18" 15W	$ 4.98
24" 20W	5.25
36" 30W	5.49
48" 40W	5.95
48" WS	3.95
48" VHO 110W	12.95
*96" 73W	8.55
*96" WS	6.95
*96" HO 110W	10.60
*96" HOWS	7.00
*96" VHOWS	8.50
*96" VHO 215W	14.20
1000 watt metal halide	76.00

FIXTURE AND LAMPS
All Standard Gro-Lux Lamps

18" single	$14.95
24" single	15.50
24" double	22.95
36" single	19.50
48" single	20.00
48" double	29.00
48" double w/hood	35.00
48" VHO	87.00
*96" double	39.50
*96" HO	72.50
*96" VHO	90.00

For fixture and lamp combination orders, figure the same weight as the fixture alone.

FIXTURES ONLY

18" single, 3 lbs	$ 10.00
24" single, 4 lbs	10.00
24" double, 6 lbs	15.00
36" single, 6 lbs	15.00
48" single, 8 lbs	15.00
48" double, 10 lbs	20.00
48" VHO double, 28 lbs	65.00
*96" double, 18 lbs	25.00
*96" HO double, 24 lbs	45.00
*96" VHO double, 30 lbs	65.00
1000 watt metal halide fixture, 24 lbs	175.00

All fixtures comes with electric cord and instructions

**Shipping Information:* Please note that these items cannot be shipped via UPS or U.S. mail because of size. Therefore it is necessary to ship via truck at a minimum rate of $18.00 for shipping and insurance for up to 100 pounds delivered to your door. $10.00 for Washington, Idaho, and Oregon residents. All truck shipments C.O.D.

Discounts on orders of 10-15: 10% off.
Call for larger quanitity prices.

INCANDESCENT PLANT LIGHTS

These lamps fit into a standard light socket. They make an excellent supplemental lighting source to be used in conjunction with fluorescent lights. They are also very good for using in places where it isn't practical to use fluorescent lamps.

60 watt, 8 oz.	$2.75
75 watt, 8 oz.	$4.75
150 watt, 8 oz.	$4.95

INCANDESCENT LIGHTING FIXTURES

This utility lighting fixture comes with a clamp so that it can be mounted anywhere. Made of porcelain.

Fixture with 6 ft cord, 2 lbs.	$5.95
With 150 watt bulb	$9.95

1,000 WATT METAL HALIDE LAMP AND FIXTURE

The Metal Halide lamp and fixture is the best artificial light source available. Plants grown with this type of light are superior to ones grown under fluorescent lighting.

The 1,000 watt high intensity makes all the difference. We will pay half of the shipping cost for this fixture and lamp to anywhere in the continental United States. Measures 23 inches in diameter and 24 inches high. Average lamp life is 12,000 hours.

1,000 watt Metal Halide	$250.00
Lamp only	76.00

MISCELLANEOUS

SWAG HOOKS

These swag hooks can be used in places where a solid backing is difficult to find. Because of the special butterfly devise, they can be used anywhere. They come in black, brass and white. Please specify.

Two per package, 4 oz. $1.49

UTILITY HOOKS

Used for hanging plants and fixtures, 3 oz. ..... 69¢ ea.

PULLEYS

In hydroponics, the plants may grow up to four inches a day. To make the chore of raising the lights an easy one, hang the lights on pulleys.

4 oz. ..... 98¢ ea.

NYLON ROPE

For hanging lamp fixtures ..... 20¢ per ft.

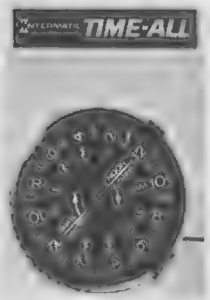
REPLACEMENT CORDS

Heavy duty 8 foot cord for use with lighting fixtures.
1 lb. $2.98

GE quick clamp plugs, for making extension cords or replacing old broken plugs. No tools needed ..... 75¢

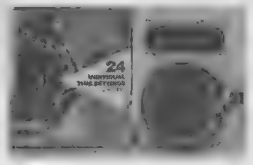
18 gage lamp cord for hooking up lamp fixture 15¢ per ft.

INTERMATIC CORDLESS TIMER



When growing plants indoors under artificial lighting, it is important to keep the day and night period the same everyday to prevent premature flowering. With the use of a timer, you can sit back and forget it. The lights will turn on and off automatically.

1875 watt capacity, 1 lb. $8.95

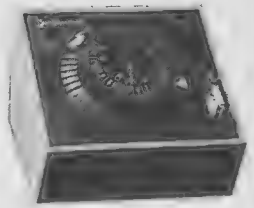


INTERMATIC MASTER CONTROL

This cordless timer can be set for up to 24 on and off periods by a simple push of a button. They are excellent for the hydroponic garden, with a minimum on off time of 60 minutes.

1875 watt capacity, 1 lb. ... $12.95

INTERMATIC EB11



The best timer we have found so far for the automation of the hydroponic garden. With a minimum on-off time of 30 minutes it can be set up to 48 on-off operations with additional trippers. Comes with two sets.

1875 watt capacity, 2 lbs. .. $14.95
Two additional trippers $1.00

HEATING OR VENTILATING CONTROL

Keep the growing room at a constant temperature automatically with this sensitive thermostat Range adjustment from 30° to 110° F. Rated at 16 amps at 120 volts 60Hz-2500 watts. Great for green house application. Instructions for electrical hook-up included.

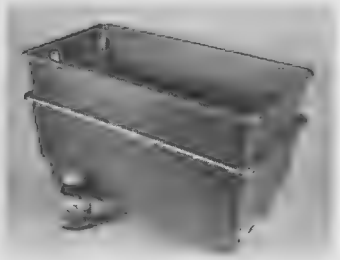
Thermostat, 1 lb. $25.95

DAYTON INDUSTRIAL TIMER

This Dayton timer is good for the larger lighting and pumping operations. Rated at 30 amps, it can be set for up to 12 on-off periods (with additional trippers). Minimum on-off time 60 minutes. Comes with one set of trippers. Instructions for wiring included.

Dayton 30 Amp Timer, 2½ lbs. $24.50
Extra trippers/one set of two ..... 98¢

MISCELLANEOUS



THE HYDRO-GROWER WICK UNIT

For trouble-free growing, this wick unit is the one to use. Once the plants are started in the growing medium you can forget it for a while. All you do is add nutrients when the plants have used it up. Measures 10" × 20" × 8". Comes

Nutrient and growing medium, 17 lbs. $23.95

THE HYDRO-GROWER II

This unit measure 21¼" × 15¾" × 7". It includes everything you need to grow large healthy plants. To feed the plants, simply pour the nutrient into the growing tray, then let it drain back. Comes with nutrient and growing medium.

27 lbs. $23.95

GROWING TRAYS

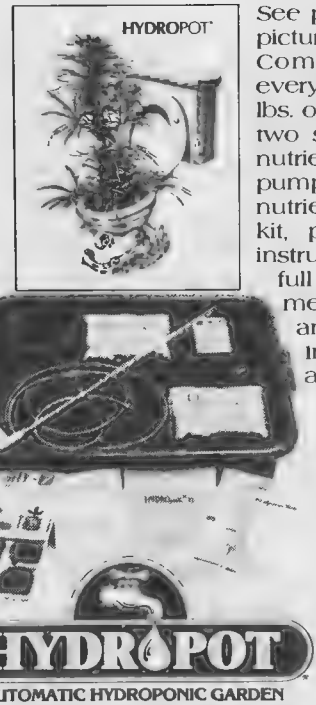
Made from high impact plastic, it measures 21¼" × 15¾" × 7".

Growing tray $4.95
2 gallon bucket, 2 lbs. $2.95

THE HYDRO-GROWER III

This unit is the same as the Hydro-Grower II, with a larger nutrient reservoir and one extra tray for more growing area. Comes with nutrient and growing medium.

40 lbs. $29.95



See pages 46 and 47 for pictures and description. Comes complete with everything but seeds: 30 lbs. of crushed Kona lava, two specially formulated nutrients, electric aeration pump, circulation system, nutrient dispenser, pH test kit, peat pellets, poster, instruction manual and full guarantee. Recommended by *High Times* and *Head* Magazines. Includes all shipping and handling. $49.95.

EZY-GRO GARDEN

This wick unit works very well for all types of plants. Made of plastic, it measures 12½"×12½"×12". It comes with nutrient, funnel for filling reservoir, and growing medium.

Ezy-Gro wick unit, 13 lbs. ... $23.95

WICKS

For use in building your own wick system or replacing old worn-out wicks. Made from a special fiber especially for hydroponic use. ..... 75¢ ft.

NUTRIENT RESERVOIR

As used on the Hydro-Grower III. Made of plastic, it holds five gallons of liquid and comes with fitting for hookup using ½" tubing.

3 lbs. $4.95

HOSE AND FITTINGS

As used on the Hydro-Grower I.

Fittings, 3 oz., Specify for ⅜ or ½ inch ..... 98¢ ea.
⅜" vinyl tubing ..... 25¢ ft.
½" vinyl tubing ..... 30¢ ft.

VINYL CLOTH

For use in lining a growing unit made of wood or metal. Excellent to use if you plan on building your own hydroponic unit. 20 gage vinyl, 54 inches wide.

Weight per foot, 1 lb. ..... $2.00 ft.

PERLITE

This product works very well as an additive to soil or as a growing medium for hydroponics. Its moisture retention is excellent.

Perlite, 5 lb. bag $2.98

VERMICULITE

This product is often used in conjunction with perlite as an additive to soil or a growing medium for hydroponics.

Vermiculite, 5 lb. bag $2.98

LITTLE GIANT PUMPS

The P-AAA is a good pump to use for smaller hydroponic units. It has a capability of 120 gallons per hour with a one foot lift, 40 gallons at four feet. Comes with a three foot, three prong cord.

P-AAA, 2 lbs. $24.50

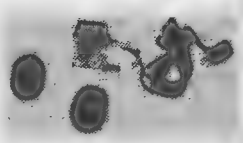
The 1-AA is a good pump to use for all applications. It has a capability of 140 gallons per hour with a one foot lift, 35 gallons at five feet. Comes with a three foot, three prong cord.

1-AA, 2½ lbs. $27.50

The Little Giant 1-42A can be used in conjunction with the 5 gallon reservoir used on the Hydro-Grower III. Pumps 140 gallons per hour.

1-42A, 2½ lbs. $28.00

FLOAT SWITCH



With the use of this float switch and a timer, any hydroponic unit can be converted to an automatic trouble-free unit. Instructions included.

Little Giant Float Switch,
2 lbs. $19.00

If you find that you need a larger pump, or if you can't find the correct fittings and accessories, please contact us. Maybe we can help.

DRILL POWERED PUMP

For the low budget hydroponic system, this Flotec pump can be used in conjunction with your electric drill. It delivers up to 200 gallons an hour.

Flotec drill motor pump, 8 oz. $6.98

NUTRIENTS

ECOGROW 10-8-14

An excellent complete balanced plant nutrient made for hydroponics. It works great for all your plants needs. A small amount goes a long way!

8 oz. $1.98
16 oz. $2.98

ORTHO FISH'N SIX 14-6-8

Made from fish emulsion and trace elements, this fertilizer works well for growing all plants. Being high in nitrogen, it grows lush green foliage. Ortho Fish'n Six is deodorized, and comes in 16 oz., 1 qt. sizes.

16 oz. $1.50
1 qt., 1 lb. $2.50

ORTHO GREENOL LIQUID IRON

Iron deficiency is one problem easily alleviated with use of Ortho Greenol. A plant with an iron deficiency will appear pale green in color, and may have brown tips. Used as directed, Greenol will help your plants back to health.

16 oz. $1.98

ROOTONE F

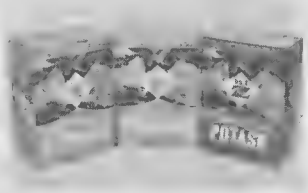
It is possible to take cuttings from your plants to start new ones. With the use of Rootone, the mortality rate is less. It contains a fungicide to help prevent damping off.

4 oz. ..... 98¢

RA-PID-GRO

This has been a favorite for growers for many years. Good for hydroponics and soil gardening alike.

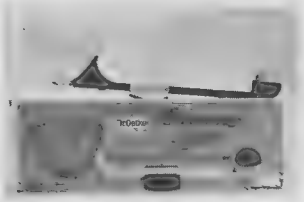
8 oz., ship. weight 1 lb. $1.50
16 oz. $2.50



SUDBURY XYZ

If you want to make up your own plant nutrient, these elements are the basis for all nutrient solutions. Nitrogen, phosphorus, and potash.

Unit Y 44% nitrogen, 1 lb. $2.29
Unit Y 44% phosphorus, 1 lb. $2.29
Unit Z 44% potash, 1 lb. $2.29



BALANCE SCALE

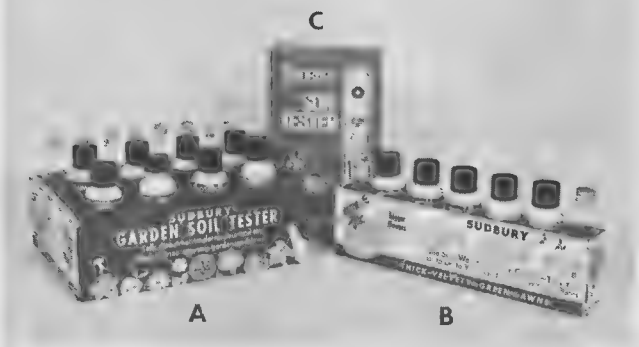
A very accurate scale than can be used to measure nutrients when mixing your own. Small capacity, 125 grams. Large capacity 500 grams. Made of high impact plastic.

Large, 2 lbs. $14.95
Small, 1 lbs. $7.95

*Note that the numbers following the brand name indicate the percentage of nitrogen, phosphorus, and potash contained in that particular nutrient.

NUTRIENTS

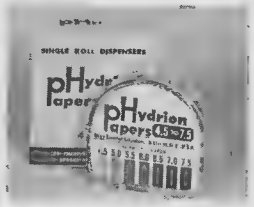
PH TEST KITS



SUDBURY PH TEST KITS

Tests PH, nitrogen, phosphorus, and potash of soil and nutrient. Grow better plants with this complete kit. Tells you what to add for optimum results. Complete instructions enclosed.

A, 3 lbs. $15.95
B, 2 lbs. $9.95
C, (PH test only), 6 oz. $2.95



PH TEST PAPER

Test water and nutrient solutions from 4.5 to 7.5 pH by simply comparing the color of the paper to the color chart.

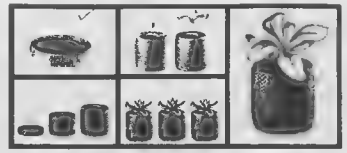
PH test paper, 5 yards $3.50

SPRAY BOTTLES

These spray bottles make the application of insecticide easy. They also work very well for foliar feeding using nutrient solution.

1 pt. bottle, 6 oz. $1.59
1 qt bottle, 1 lb. $2.25

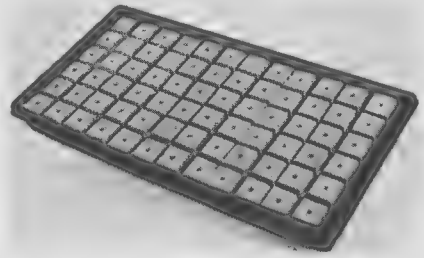
POTS



JIFFY-7

These pellets will expand when soaked in water for a short period of time. They are very good for starting seeds in. To transplant, simply place the whole pellet into the soil.

Jiffy-7, ½ lb. per doz. ..... 70¢ dozen



BR 8 GROWING CUBES

These cubes are the best thing on the market to use for starting seeds in. They are made of a cellulose fiber that is PH balanced. It will not affect the nutrient PH.

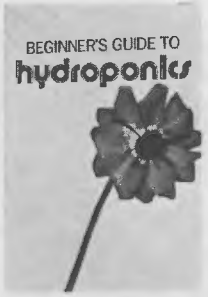
BR 8's, 6 oz. per doz. ..... 75¢ doz.
10 and over ..... 69¢ doz.
Plastic tray ..... 98¢ ea.

JIFFY POTS

These pots, made of compressed peat moss, are the best bet to start seeds in. They will last for a long time outside of soil, but will decompose when planted into soil. They will save time and energy when transplanting.

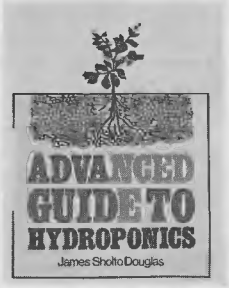
2¼" diameter ..... 59¢ doz.
3" diameter ..... 79¢ doz.
4" diameter ..... $1.49 doz.
(½ lb. per dozen)

BOOKS



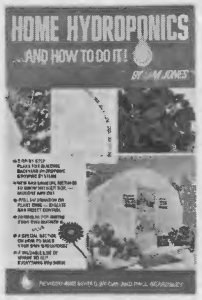
Beginners Guide to Hydroponics

by James Sholto Douglas ... $3.95
A very good introduction to hydroponics. It is a complete guide for the grower who wishes to raise vegetables and herbs.



Advanced Guide to Hydroponics

by James Sholto Douglas .. $12.95
This hard back cover edition is the latest book written by James Sholto Douglas. It is an excellent book on the subject, though much of it is technical.



Home Hydroponics And How To Do It

by Lem Jones $4.98
This book is loaded with hints for the home hydroponic gardener. An excellent reference for the grower interested in tomatoes, cucumbers, lettuce and many other vegetables. One of the better books on the subject.

Soiless Culture

by T. Sandy..... $3.95
This book is full of facts about hydroponic gardening. If you are really interested in hydroponics, you will want to read this one. It is a little more technical than most books on the subject.

Hydroponic Gardening

by Ramond Bridwell $3.95
The complete guide for the hydroponic gardener and more. This book contains a lot of valuable information that will help better your garden.

How to Grow Marijuana Indoors Under Lights

by Murphy Stevens..... $3.95
An excellent book on the subject of cultivating Marijuana indoors. Everything you need to know, from germinating seeds to harvesting. Sixteen pages of color.

Indoor Marijuana Cultivation

by Murphy Stevens..... $2.95
Similar in content to Murphy's first bestselling book, *How to Grow Marijuana Indoors Under Lights*, this guide trims down the information to fit the needs of the hobby grower. Photographs on almost every page illustrate the clear, concise chapters on soil, containers, light, watering, bugs, harvesting, curing, etc.

Cooking With Marijuana

by Evelyn Schmevelyn $2.95
Smoking more and enjoying it less? Try eating your next lid. This marijuana cookbook has plenty of palatable recipes. Some of which are delicious.

BOOKS

BOOKS

Cultivators Handbook of Marijuana

by Bill Drake $2.50

This book is one of the first books on the subject of cultivation. It is a very good book to have if you are interested in cultivating plants indoors or outdoors using soil.

Magical Mushroom Handbook

by Richard Miller and David Tatelman $2.95

This 58-page, pocket size field guide details the more common phylocybin mushrooms found in the United States. Included are line drawings and color photos that make identification easy.

The Pill Book

by Vito Perillo $3.95

This 64 page paperback is a reference and identification guide to the most widely used and abused prescription drugs. Eight pages of color plates show amphetamines (Christmas Trees, Black Beauties, etc.), sedatives (Quaaludes, Sopors, etc.) tranquilizers (Valium, Librium, etc.) and many more.

How To Identify and Grow Psilocybin Mushrooms

by Jule Stevens and Rich Gee $5.95

At last, a mushroom book that is easy to understand and informative. Written in laymens terms, it contains a complete field guide for all psilocybin species, with over 30 color photographs for easy identification. Plus, tried and tested fool-proof methods of cultivating mushrooms.

Directions for Figuring Out Shipping Charges

1. On all products there is a weight of the item (except book items, see step 4). Total all weights.
2. Look at the zone chart to find your zone. The first three numbers of your zip code tell you your zone (example 80072 is Zone 6).
3. We ship UPS unless otherwise specified. Find the weight of your shipment (from step 1). Look at the Rate Chart and find the amount (example 6 lbs. in zone 8 would be $2.53).
4. For book orders alone add $1.00 for shipping.
5. Now take the shipping amount from line 3 and add this under shipping on your order blank.

We can also send air-freight or parcel post.

ZONE CHART
For Shippers With Zip Codes
980-01 to 982-99

United Parcel Service

LOCATION CHART

TO FIND ZONE, TAKE FIRST THREE DIGITS OF ZIP CODE TO DESTINATION PARCEL IS GOING. IN LISTED AND REFER TO CHART BELOW.

ZIP CODE PREFIXES	UPS ZONE	ZIP CODE PREFIXES	UPS ZONE	ZIP CODE PREFIXES	UPS ZONE
010-089	8	712-714	8	900-918	5
		716-722	7	920-921	6
100-199	8	723	8	922-954	5
		724-737	7	955	4
200-299	8	738-739	6	956-958	5
		740-758	7	959-961	4
300-397	8	759	8	970-972	2
		760-769	7	973-974	3
400-462	8	770-777	8	975-976	4
463-466	7	778	7	977-978	3
467-492	8	779	8	979	4
493-499	7	780-782	7	980-986	2
		783-785	8	988-989	2
500-504	7	786-788	7	990-994	3
505	6	789	8		
506-508	7	790-791	6		
510-515	6	792-797	7		
516-539	7	798-799	6		
540	6				
541-549	7	800-803	6		
550-554	6	804-805	5		
556-559	7	806-813	6		
560-576	6	814-831	5		
577	5	832-834	4		
580-585	6	835	3		
586-593	5	836-837	4		
594-599	4	838	3		
		840-847	5		
600-668	7	850-859	6		
669	6	860	5		
670-673	7	863	6		
674-693	6	864	5		
		865-884	6	SEATTLE LOCAL ZONE	
700-708	8	890-893	5	Fort Lawton, Georgetown, Northgate, Seattle	
710-711	7	894-898	4		

United Parcel Service — Effective May 1, 1978

COMMON CARRIER RATE CHART INTERSTATE

ANY FRACTION OF A POUND OVER THE WEIGHT SHOWN TAKES THE NEXT HIGHER RATE

WEIGHT NOT TO EXCEED	RATES TO ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8	WEIGHT NOT TO EXCEED	RATES TO ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
1lb.	$.82	$.84	$.87	$.90	$.94	$.99	$1.04	26lb.	$2.67	$3.14	$3.89	$4.70	$5.87	$7.06	$8.49
2 "	.89	.93	.99	1.05	1.14	1.23	1.34	27 "	2.74	3.23	4.01	4.85	6.06	7.31	8.79
3 "	97	1.02	1.11	1.20	1.34	1.47	1.64	28 "	2 82	3.32	4 13	5.00	6.26	7.55	9.09
4 "	1.04	1.11	1.23	1.35	1.53	1.72	1.94	29 "	2.89	3.41	4.25	5.15	6.46	7.79	9.39
5 "	1.11	1.20	1.35	1.50	1.73	1 96	2.23	30 "	2 96	3.50	4.37	5.30	6.65	8 03	9.68
6 "	1.19	1.30	1.47	1.66	1.93	2.20	2.53	31 "	3.04	3.60	4.50	5.46	6.85	8.28	9.98
7 "	1.26	1.39	1.59	1.81	2.12	2.45	2.83	32 "	3 11	3.69	4.62	5.61	7 05	8 52	10.28
8 "	1.34	1.48	1.71	1.96	2.32	2.69	3.13	33 "	3.19	3.78	4.74	5 76	7.25	8 76	10.58
9 "	1.41	1.57	1.83	2 11	2.52	2.93	3.43	34 "	3 26	3.87	4.86	5 91	7 44	9.01	10.88
10 "	1.48	1.66	1.95	2.26	2.71	3.17	3.72	35 "	3 33	3 96	4.98	6.06	7 64	9 25	11.17
11 "	1.56	1.76	2.08	2.42	2.91	3 42	4.02	36 "	3 41	4.06	5 10	6.22	7.84	9.49	11.47
12 "	1.63	1.85	2 20	2.57	3.11	3 66	4.32	37 "	3 48	4.15	5.22	6 37	8.03	9.74	11.77
13 "	1 71	1.94	2.32	2.72	3.31	3 90	4.62	38 "	3 56	4.24	5.34	6.52	8.23	9.98	12 07
14 "	1 78	2.03	2.44	2.87	3.50	4 15	4.92	39 "	3 63	4.33	5.46	6 67	8.43	10.22	12.37
15 "	1.85	2.12	2.56	3 02	3.70	4 39	5.21	40 "	3 70	4 42	5.58	6 82	8.62	10 46	12 66
16 "	1.93	2.22	2.68	3 18	3.90	4.63	5 51	41 "	3 78	4.52	5.71	6.98	8.82	10 71	12.96
17 "	2 00	2.31	2 80	3 33	4.09	4.88	5.81	42 "	3.85	4.61	5.83	7 13	9.02	10.95	13.26
18 "	2.08	2.40	2.92	3.48	4.29	5.12	6.11	43 "	3 93	4.70	5 95	7 28	9 22	11 19	13.56
19 "	2.15	2 49	3 04	3.63	4.49	5.36	6.41	44 "	4 00	4.79	6 07	7.43	9.41	11 44	13.86
20 "	2.22	2 58	3.16	3 78	4.68	5.60	6.70	45 "	4 07	4.88	6.19	7.58	9.61	11.68	14.15
21 "	2.30	2.68	3.29	3.94	4.88	5.85	7 00	46 "	4 15	4.98	6.31	7.74	9.81	11.92	14.45
22 "	2.37	2.77	3.41	4.09	5.08	6 09	7.30	47 "	4 22	5 07	6 43	7.89	10.00	12 17	14.75
23 "	2.45	2.86	3.53	4.24	5.28	6.33	7.60	48 "	4 30	5 16	6 55	8 04	10.20	12.41	15.05
24 "	2 52	2.95	3.65	4.39	5.47	6.58	7.90	49 "	4 37	5 25	6 67	8.19	10 40	12.65	15 35
25 "	2.59	3.04	3.77	4.54	5.67	6.82	8 19	50 "	4 44	5 34	6 79	8.34	10 59	12 89	15.64

ADDITIONAL CHARGES:

For each COD received for collection — 85 cents.
For each Address Correction — 85 cents
For each Acknowledgment of Delivery (AOD) — 20 cents
For each package with a declared value over $100 — 25 cents for each additional $100 or fraction thereof

WEIGHT AND SIZE LIMITS:

Maximum Weight per package — 50 POUNDS.
Maximum Weight of all packages from one shipper to one consignee in one day — 100 pounds
Maximum Size per package — 108 INCHES IN LENGTH AND GIRTH COMBINED.
Minimum charge for a package measuring over 84 inches in length and girth combined will be equal to charge for a package weighing 25 pounds.

See separate rate chart for BLUE LABEL AIR

BLUE LABEL AIR

SERVICE: Entire State / Partial State	RATE CHART COLUMN	TERRITORY SERVED
ALABAMA	C	Entire State
ALASKA	E	See Points Served
ARIZONA	A	Entire State
CALIFORNIA	A	See Zip Codes Served
COLORADO	A	See Points Served
CONNECTICUT	C	Entire State
DELAWARE	C	Entire State
DISTRICT OF COLUMBIA	C	Entire Area
FLORIDA	C	Entire State
GEORGIA	C	Entire State
HAWAII	D	See Points Served
ILLINOIS	B	Entire State
INDIANA	B	Entire State
IOWA	B	Entire State
KANSAS	B	See Points Served
KENTUCKY	B	Entire State
MAINE	C	Entire State
MARYLAND	C	Entire State
MASSACHUSETTS	C	Entire State
MICHIGAN	B	Entire State
MINNESOTA	B	Entire State
MISSOURI	B	Entire State
NEBRASKA	B	See Points Served
NEVADA	A	See Zip Codes Served
NEW HAMPSHIRE	C	Entire State
NEW JERSEY	C	Entire State
NEW MEXICO	B	Entire State
NEW YORK	C	Entire State
NORTH CAROLINA	C	Entire State
NORTH DAKOTA	B	See Points Served
OHIO	B	Entire State
PENNSYLVANIA	C	Entire State
RHODE ISLAND	C	Entire State
SOUTH CAROLINA	C	Entire State
TENNESSEE	C	Entire State
TEXAS	B	See Points Served
VERMONT	C	Entire State
VIRGINIA	C	Entire State
WEST VIRGINIA	C	Entire State
WISCONSIN	B	Entire State
WYOMING	A	Entire State

RATE CHART

WEIGHT NOT TO EXCEED	A	B	C	D	E
1 lb.	$1.24	$1.28	$1.41	$2.09	$2.17
2 "	1.72	1.81	2.07	2.68	2.72
3 "	2.21	2.34	2.72	3.27	3.27
4 "	2.69	2.87	3.38	3.86	3.82
5 "	3.18	3.39	4.03	4.45	4.37
6 "	3.66	3.92	4.69	5.04	4.92
7 "	4.15	4.45	5.35	5.63	5.47
8 "	4.63	4.98	6.00	6.22	6.02
9 "	5.12	5.51	6.66	6.61	6.57
10 "	5.60	6.03	7.31	7.39	7.12
11 "	6.09	6.56	7.97	7.98	7.68
12 "	6.57	7.09	6.63	6.57	8.23
13 "	7.06	7.82	9.28	9.16	8.78
14 "	7.54	6.15	9.94	9.75	9.33
15 "	8.03	6.67	10.59	10.34	9.68
16 "	6.51	9.20	11.25	10.93	10.43
17 "	9.00	9.73	11.91	11.52	10.98
18 "	9.48	10.26	12.56	12.11	11.53
19 "	9.97	10.79	13.22	12.70	12.06
20 "	10.45	11.31	13.87	13.28	12.63
21 "	10.94	11.84	14.53	13.67	13.19
22 "	11.42	12.37	15.19	14.46	13.74
23 "	11.91	12.90	15.84	15.05	14.29
24 "	12.39	13.43	16.50	15.64	14.84
25 "	12.98	13.95	17.15	18.23	15.39
26 "	13.38	14.48	17.61	16.82	15.94
27 "	13.85	15.01	16.47	17.41	16.49
28 "	14.33	15.54	19.12	16.00	17.04
29 "	14.62	16.07	19.78	16.59	17.59
30 "	15.30	16.59	20.43	19.17	16.14
31 "	15.79	17.12	21.09	19.76	18.70
32 "	16.27	17.85	21.75	20.35	19.25
33 "	16.76	16.16	22.40	20.94	19.80
34 "	17.24	16.71	23.06	21.53	20.35
35 "	17.73	19.23	23.71	22.12	20.90
36 "	18.21	19.76	24.37	22.71	21.48
37 "	16.70	20.29	25.03	23.30	22.00
38 "	19.18	20.62	26.66	23.89	22.55
39 "	19.67	21.35	26.34	24.48	23.10
40 "	20.15	21.87	26.99	25.06	23.65
41 "	20.64	22.40	27.65	25.65	24.21
42 "	21.12	22.93	28.31	28.24	24.76
43 "	21.61	23.48	28.96	28.83	25.31
44 "	22.09	23.99	29.62	27.42	26.68
45 "	22.59	24.51	30.27	28.01	26.41
46 "	23.06	25.04	30.93	28.60	26.98
47 "	23.55	25.57	31.59	29.19	27.51
48 "	24.03	26.10	32.24	29.76	29.06
49 "	24.52	26.63	32.90	30.37	28.61
50 "	25.00	27.15	33.55	30.95	29.16

ADDITIONAL CHARGES:
For each COD received for collection — 85 cents
For each Address Correction — 85 cents.
For each Acknowledgment of Delivery (AOD) — 20 cents

Indoor Garden Supply Co.
P.O. Box 17011,
Seattle, Washington 98107
(206) 789-4404

Name (Please Print) _____

Address _____

City _____ State _____ Zip _____

- Minimum order $5.00.
- We accept COD orders with 50% deposit on items not requiring shipment by truck.
- We accept COD orders by phone for items under $25.00 not requiring shipment by truck.
- We accept BankAmericard and Mastercharge for phone orders and mail orders.
- **For faster service, send money order or cashiers check.**
- For orders outside the USA, please add postage to the amount sent, for we cannot send COD outside the country.
- All shipments insured against breakage.
- Prices are subject to change without notice.

Name of Item	How Many	Weight	Unit Price	Total

Subtotal

Washington State Residents add 5.4% sales tax

Shipping

TOTAL

☐ COD
☐ Check
☐ Money Order
☐ Charge

Date _____

When ordering books only, add $1.00 for postage.

Indoor Garden Supply Co.
P.O. Box 17011,
Seattle, Washington 98107
(206) 789-4404

Name (Please Print) _____

Address _____

City _____ State _____ Zip _____

- Minimum order $5.00.
- We accept COD orders with 50% deposit on items not requiring shipment by truck.
- We accept COD orders by phone for items under $25.00 not requiring shipment by truck.
- We accept BankAmericard and Mastercharge for phone orders and mail orders.
- **For faster service, send money order or cashiers check.**
- For orders outside the USA, please add postage to the amount sent, for we cannot send COD outside the country.
- All shipments insured against breakage.
- Prices are subject to change without notice.

Name of Item	How Many	Weight	Unit Price	Total

Subtotal

Washington State Residents add 5.4% sales tax

Shipping

TOTAL

☐ COD
☐ Check
☐ Money Order
☐ Charge

Date _____

When ordering books only, add $1.00 for postage.